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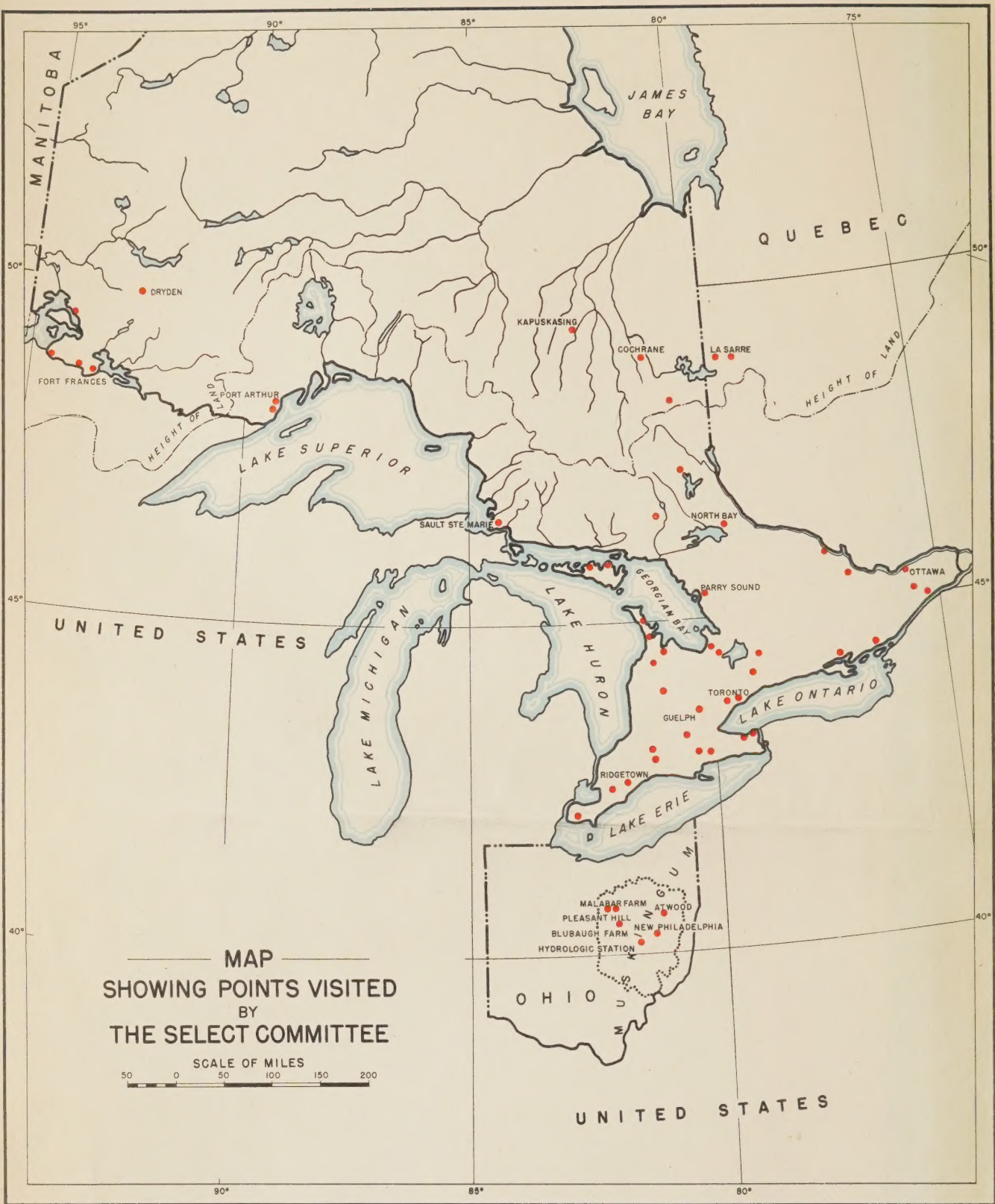
G. H. MILLARD

REPORT
to the
ONTARIO LEGISLATURE
from the
SELECT COMMITTEE
on
CONSERVATION



TORONTO
1950

Ontario. Legislative assembly. [Committee]
Select Committee on Conservation
Report
1950.



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REPORT
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ONTARIO LEGISLATURE
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SELECT COMMITTEE
ON
CONSERVATION



TORONTO

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1950

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TO THE HONOURABLE THE LEGISLATIVE ASSEMBLY OF
THE PROVINCE OF ONTARIO.

Honourable Members:

On April 7, 1949, during the First Session of the
Twenty-third Legislature, the following resolution was passed:

"That a Select Committee of this House be appointed to study all aspects of conservation, notably, (1) soil depletion, (2) drainage, (3) flood control, (4) reforestation, (5) local demonstration farms, (6) soil analysis. Such Committee to have authority to send for persons, papers and things, to sit during the recess of the House, and to report its findings to the House at the next Session thereof. Such Committee to be composed as follows: Messrs. Thomas (Elgin), Chairman, Dent, Hunt, Isley, Janes, Jolliffe, McMillan, Oliver and Villeneuve."

This Committee, having completed its work, respectfully presents the report which follows.

Signed:

J. S. Thomas

T. R. Dent

S. J. Hunt

T. H. Isley

J. Janes

Thomas J. Jolliffe

E. B. McMillan

J. R. Oliver

P. J. Villeneuve


Dated at Toronto, March 15, 1950.

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FOREWORD

This Committee has been deeply impressed by the importance of the issues and problems which appeared in its study of all aspects of conservation in Ontario. It was most gratifying to find that great interest in these matters is stirring in all walks of life. Wherever the Committee went throughout Ontario there were citizens and organized groups eager to be of assistance. The public response to the challenge of conservation bodes well for the success of a program which may be initiated at this time.

At the public hearings held for every county and district in the province, briefs of very high quality, prepared by municipal, agricultural and other bodies, were presented and discussed. All persons taking part proved their sincerity and public spirit, and their conduct can only be described as a credit to our democracy. The same must be said of the provincial organizations which presented many carefully considered briefs with information and suggestions of the highest value.

Whatever worth this Report may have is due in large part to the work of organizations and individuals too numerous to mention here, all of whom freely and cheerfully gave every aid within their power.

Public servants in almost every department of the Ontario Government, frequently called upon, were unsparing in their efforts to assist. The Committee keenly appreciates the co-operation shown by so many in the Departments of Agriculture, Lands and Forests and the Conservation Branch of the Department of Planning and Development. Particular acknowledgement is due to the agricultural representatives and to the foresters and pilots without whose work the Committee's Itinerary would have been impossible.

The Committee is also heavily indebted to the scientists and officials of the Dominion Experimental Farms

and other federal agencies, who gave all possible help, sometimes at real inconvenience to themselves.

Educational institutions, including the Ontario Agricultural College, the Ontario Veterinary College and most of the Universities, rendered the Committee services of special significance.

It is a pleasure to record the kindness extended by public servants in our sister-province of Quebec, who spent much time and effort demonstrating and explaining agricultural and colonization projects in the La Sarre area.

The Committee visited a notable laboratory of conservation practices in the State of Ohio. Many courtesies were extended by the officers of the Muskingum Conservancy District and the Soil Conservation Service of the U.S. Department of Agriculture as well as by Ohio farmers and other individuals. Information received from them has been of great value.

From time to time certain citizens having special qualifications were drafted as witnesses. In each and every case they gladly gave the Committee the benefit of their expert opinion and technical knowledge on important matters.

At all times the radio broadcasting stations, daily and weekly newspapers and the agricultural press showed the utmost co-operation and a lively interest in the cause of conservation.

The Committee wishes to express appreciation of the faithful services rendered by its hard-working Secretary, Mr. Herbert F. Crown, of the Conservation Branch of the Department of Planning and Development.

SUMMARY OF THE RECOMMENDATIONS

IN THIS REPORT

SCIL

Soil Surveys

A determined effort should be made by the Province in continued co-operation with the Dominion, to accelerate the soil surveys by Counties which have been under way for some years past, so that they may be completed and both maps and reports published in the near future. P.31.

Demonstration Farms

Government grants to County Crop Improvement Associations should be increased so that they may undertake an extended program of local demonstrations to show the importance of grassland improvement in Ontario, emphasizing the value of permanent and semi-permanent seeding of grass and legumes on sloping and marginal lands and their key role in the conservation program. P.37.

In co-operation with the County Crop Improvement Associations, every encouragement and assistance should be given to promoting special demonstration projects and "pilot farms", operated by practising farmers, which would apply the findings of research in a practical way under local leadership with such technical assistance from the Land Use Advisory Services as may be necessary. P.67-8.

Soil Erosion

Research and extension work should be undertaken on the following questions:

- (1) The intensity and frequency of rain in various areas of Ontario, and the relative ability of differing soil types to absorb water.
- (2) The use of fall and winter cover crops.
- (3) The effectiveness of fall versus spring plowing.
- (4) The width of crop strips in relation to the control of both water and wind erosion. P.42.

Farm Underdrainage

There should be an expansion of the planning and inspection service provided by the drainage division at the Ontario Agricultural College and Kemptville Agricultural School, and

The Tile Drainage Act should be amended so as to require from the inspector a certificate that the tile drain has been properly and satisfactorily laid as to levels, and will do the work expected of it, along with a plan of the tile drain. P.55.

Provision should be made in The Tile Drainage Act for regulations to be made establishing standards and specifications for tile drains, both clay and concrete, with which tile manufacturers will be required to comply, and

A licensing and inspection service for tile manufacturing plants should be established to assure minimum standards of quality for agricultural tile. P.55-56.

Drainage demonstrations and research should be conducted on the major agricultural soil types of Ontario. P.58.

Municipal Drainage

The Municipal Drainage Act should be amended to

- (1)
 - (a) Provide that an engineer reporting to council should be required to include an opinion on the merits of the project in the light of land use and conservation principles, and
 - (b) Give any landowner affected the right to appeal after the adoption of an engineer's report, on grounds relating to land use or conservation, as well as the present grounds, and
 - (c) Provide for the abandonment of drainage schemes where maintenance is found to be unsound or uneconomic. P.59.
- (2) Provincial subsidies on the construction, improvement or reconstruction of the trunk channel or channels, (excluding lateral drains or branches but including a pro rata share of all incidental expenses) should be applied to all such works, including those costing less than \$5,000. P.60
- (3) Such subsidies should be granted on the following scale:
 - (a) In the counties - 33 1/3 per cent;
 - (b) In the municipalities of the territorial districts - 66 2/3 per cent;
 - (c) In that part of the territorial districts not within a municipality - up to 80 per cent. P.60.

The Government should exercise its power under Section 93a of The Municipal Drainage Act to designate (instead of individual referees) The Ontario Municipal Board as sole drainage referee for the Province, and

The Government should appoint to The Ontario Municipal Board a conservationist specially qualified in land use and the agricultural sciences. P.61.

The five principal statutes relating to drainage should be co-ordinated and consolidated into one Drainage Act. P.62.

Drainage legislation should be amended to require that copies of engineers' reports if adopted, plans, awards, referees' decisions and adequate records relating to all drains and ditches should be filed with township clerks and registered with respect to the lands affected in county registry offices. P.63.

Co-ordination of Agricultural Services

The Ontario Agricultural College, the Ontario Veterinary College and the Macdonald Institute of Home Economics should be federated into one educational institution under a President and three Deans, namely, a Dean of Agriculture, a Dean of Veterinary Sciences and a Dean of Home Economics. P.67-1.

There should be a Board of Regents for the federated institutions consisting of 12 members whose duty it would be to study and make recommendations on matters of policy, administration and finance. P.67-1-2.

The Board of Regents in the first instance should be appointed for staggered terms of two, three and four years respectively. P.67-2.

The Director of Extension for Agriculture and all agricultural officials, other than those engaged in the administration of legislation or in inspection, should be transferred from Toronto to Guelph to facilitate close co-operation with the appropriate departments of the federated institutions, and

The Director of Extension should remain directly responsible to the Deputy Minister of Agriculture as at present to facilitate the direct co-ordination of extension work among the Federated Institutions at Guelph, the Agricultural School at Kemptville, the Horticultural Experiment Station at Vineland and the Western Ontario Experimental Farm at Ridgetown, and

The Director of Extension should have supervision over all the county offices of the Department of Agriculture and in addition should direct the whole program of agricultural extension in Ontario, and

All extension at the county or farm level should be integrated with and co-ordinated through the agricultural representatives in the county offices, so that extension staff from any department of the Federated Institutions at Guelph or the Western Ontario Experimental Farm at Ridgetown, the Horticultural Experiment Station at Vineland or the Kemptville Agricultural School, would work through the county offices of agricultural representatives. P.67-3-4.

Extension workers should be given special training in the use of radio and eventually television for promotion of the conservation program, and

A larger series of suitable conservation films should be prepared and made available for the widest possible showing not only by extension workers but also by schools and interested organizations. P.67-4.

Associate Representatives should be appointed with salaries corresponding to those of Representatives so that they might remain for longer periods in the counties where they become familiar with local conditions, and

Extension work in connection with boys' clubs and the like should be conducted by specially trained club leaders on a regional rather than a county basis, thereby releasing Representatives and their associates or assistants for conservation work. P.67-5.

In addition to the veterinary laboratories soon to be established at Kemptville and Kingston, a third laboratory should be established as soon as personnel are available in north-western Ontario, a fourth in Bruce or Grey County and a fifth at Ridgetown. P.67-11.

Agricultural Research

There should be appointed to the staff of the Ontario Agricultural College research specialists in animal genetics and statistical design of research. P.67-16.

Financial Assistance to Young Farmers

The Government of the Province of Ontario should recognize the responsibility of providing long term credit through some agency to meet the problem of assisting young experienced farmers to establish themselves on farms. P.74

Settlement in Northern Ontario

No new township or area in Northern Ontario should be opened for agricultural settlement until a basic land use survey has been made with favourable findings. P.78.

All outstanding indebtedness for seed grain, feed shortage 1922, feed shortage 1933, cattle purchase, agricultural implements and settlers' advances made under The Northern Development Act or any predecessor to that Act should be written off and discharged. The Northern Development Act should be repealed and any lands vested in the Settlers' Loan Commission should be transferred to the Commissioner of Agricultural Loans for disposition. P.79.

In opening Northern Ontario for settlement a percentage of the area should be set aside as community forests within which local settlers may on application be granted cutting permits. P.79.

Consideration should be given to the recovery by the Crown of surface rights granted prior to 1918 for mining purposes. P.80.

WATER

Flood Control

To reduce excessive water run-off, which aggravated the flooding of river valleys, land use practices tending to soil wastage, soil depletion and soil erosion must be discouraged and discontinued, and the farm planning program set out in the chapter on Soils in this report must be adopted and implemented. P.85.

The program of restoring tree cover to the non-arable lands of Ontario, referred to in the chapter of this report on Forestry, should be implemented as an aid to the stabilization of run-off, summer flow and ground-water supply. P.86.

In co-operation with the appropriate department of the Ontario Government, all river gauging stations should be brought under the direct supervision of the Dominion Water and Power Bureau and the Federal Government should be urged to expand their hydrologic studies on rivers throughout Ontario. P.87.

Where the construction of large reservoirs is an integral part of flood control, these should be financed jointly by Dominion, Provincial and Municipal Governments, through organized conservation authorities. P.89.

Immediate study should be made of the practicability of employing tugs, or ice-breakers, for opening river channels to prevent spring flooding. P.90

Municipal Water Supply

Legislation should be enacted which would regulate the ground-water supply of urban and industrial users with a view to protecting prior rights of residents of other municipalities affected, and at the same time providing for an equitable distribution of such ground water to all claimants. P.93.

The Government should arrange a conference of the interested agencies - federal, provincial, municipal and educational institutions - with a view to accelerating ground-water studies and formulating specific recommendations for action. P.95.

A detailed survey should be made to ascertain the feasibility and costs of piping water from the Great Lakes system to be distributed as a public utility for the benefit of participating municipalities. P.97.

Farm Ponds

Research work should be done on the design and construction of farm ponds for Ontario purposes, extension men should be trained to give technical assistance and further efforts should be made to publicize the multi-purpose value of the farm pond. P.104.

Small Dams

The Department of Lands and Forests should proceed with rebuilding desirable dams that are out of repair and building new dams at strategic sites, and

Where public funds are used in the repair or construction of dams, sufficient acreage should be acquired to provide for public recreation. P.108.

Lakeshore Erosion

The Dominion, Provincial and Municipal Governments should recognize the public responsibility for assistance in lakeshore erosion prevention. P.111.

The Federal Government should be urged to commence a study of lake currents and their effects on shore erosion. P.111.

The Government through its appropriate department should commence the engineering studies which must precede any construction of protective works for the prevention of lakeshore erosion. P.111.

Legislation should be enacted authorizing the creation of lakeshore authorities to deal with shore erosion. P.112.

Municipalities should be given the authority to restrict or prohibit further building in danger zones near cliffs or eroding shorelines. P.112.

FORESTRY

The Farm Woodlot

The Trees Conservation Act of 1946 should be repealed and similar legislation enacted which would apply to all counties and make provision for enforcement. P.117.

On application to the Minister of Lands and Forests, the boundaries of the fire district should be extended to include those municipalities or areas that have 25 per cent or more of their area classified as woodland, slash, waste or swamp lands, and

In all other municipalities the Minister of Lands and Forests should be empowered to enter into agreements to provide forest fire protection and to charge a portion of the cost back to the said municipality. P.118.

The Dominion Government should be asked to consider amending The Income War Tax Act so that landowners will no longer be penalized for cropping their timber in accordance with conservation practices. P.119.

Dominion-Provincial Reforestation

The Province should undertake to reforest approximately 3,600 square miles of the Precambrian Shield area during the next twenty-five years, and

The present provincial forest nurseries should be expanded or new nurseries established to provide sufficient trees to reach the twenty-five year objective, and

The plans for large reforested areas should provide suitable locations for public recreational use, and

All sums expended for such reforestation in the Precambrian area should be chargeable as expenditure upon capital account, and financed as a joint Dominion-Provincial program. P.121-122.

Municipal Reforestation

Legislation should be enacted permitting urban municipalities to purchase land outside their limits for reforestation purposes, and

The Municipal Reforestation Act should be amended so that cities, towns and villages may enter into a forest management agreement with the province on the same basis as counties and townships, with provision that the taxation of their reforested lands should be based on a fixed assessment, subject to review at regular intervals by The Ontario Municipal Board. P.124.

Legislation should be enacted providing that tax-delinquent lands may be acquired by a municipality or by the province for reforestation purposes. P.125.

Private Reforestation

The Department of Lands and Forests should set up a system whereby tree-planting machines and personnel as well as trees are made available for reforestation of five acres or more on private lands, subject to the following conditions:

(1) Where an agreement is made between the landowner and the Crown providing that the lands reforested shall remain under forest management, the landowner shall be required to pay only a percentage of the cost of the reforestation.

(2) Where no such agreement is made between the landowner and the Crown the owner shall be required to pay the full cost of reforestation. P.128-129.

A nominal charge should be made for nursery stock distributed by the Department of Lands and Forests. P.129.

Forest Research

The present research program should be expanded to ascertain the method and species most suitable for reforestation:

- (1) The Precambrian Shield.
- (2) The Limestone Plains.
- (3) Marshy and poorly drained areas. P.138

FISH & WILDLIFE

The Government should provide for an increase in fundamental research leading to a knowledge of the critical factors controlling fish and wildlife populations. P.141

A Guides' Course should be held at the Ontario Forest Ranger School to train an adequate number of guides from various districts in the province. P.142.

RECREATION

Suitable acreages should be acquired by the province for public recreational use, fronting dams and reservoirs. P.146

The Government should formulate a policy with respect to acquiring lands for public recreational purposes in Southern Ontario. P.146.

The Government should acquire sufficient lands fronting the proposed St. Lawrence reservoirs to be used for public recreation. P.146.

EDUCATION

The publication and distribution of educational literature - for children as well as adults - should be continued and that more use should be made of radio broadcasts and motion pictures for conservation purposes. P.149

Every encouragement should be given to the establishment of run-off demonstration plots at suitable locations throughout Ontario. P.150.

The Department of Lands and Forests should intensify its campaign against carelessness in the woods and that other departments such as Highways and Education as well as Travel and Publicity should be asked to co-operate most vigorously to the same end. P.151.

Greater emphasis should be given to the teaching of conservation in both elementary and secondary schools, both rural and urban. P.155.

The normal schools, the college of education and the universities of Ontario should be asked to consider whether their curricula give due regard to the importance of conservation, both as a science and in its bearing upon other subjects. P.155-156.

CONSERVATION AUTHORITIES

The work of Conservation Authorities should be accelerated by appointment of co-ordinating officers, as has been done on the Upper Thames Authority to integrate the broad fields of conservation for the area and act as a liaison between the Authority and the different departments of the government in carrying out conservation programs. P.160.

The Conservation Authorities Act, 1946, should be amended to provide for the raising of money from municipalities receiving either direct benefit or indirect benefit from any works undertaken by an Authority. P.160.

The Conservation Authorities Act should be amended to permit benefitting municipalities to raise their portion of the Authority's assessment for a program from those lands of the municipality within the watershed which actually benefit from the program. P.161.

The policy of the government in financing work of Conservation Authorities should be broadened as follows:
(1) To allow for larger grants for flood control schemes where the benefitting municipalities are for the most part rural. (2) To allow for a substantial grant towards

the cost of engineering, so that Authorities may build up a backlog of schemes for future activity if and when the economic situation in the province requires it. P.162.

DOMINION PROVINCIAL RESPONSIBILITIES

There should be Provincial-Federal agreements with respect to financing and participation in the following types of conservation projects: (a) State Forests, (b) Flood Control Reservoirs, and (c) Lakeshore Erosion. 'P. 165 - 166.

PROVINCIAL ADMINISTRATION

The Department of the Prime Minister should be vested with responsibility for the overall policy and program of conservation in Ontario. P.171.

For purposes of administration the Prime Minister should appoint a Chief of Conservation, having the status of a Deputy Minister, whose duty it would be to bring about co-ordination and co-operation of all interested departments and agencies in matters relating to conservation. P.171.

An inter-departmental conservation committee should be established with the Chief of Conservation as Chairman, each department concerned to be represented by the Deputy Minister or other senior official designated by the Minister. P.171-172.

Estimates required to implement a conservation program should be consolidated under the Prime Minister's Department, and the funds disbursed by the appropriate department in the field. P.172.

At each session of the Legislature a Standing Committee on Conservation should be appointed to review the program and work of the year. P.172.

MISCELLANEOUS

Weed Control

The Dominion Government should be requested to amend The Canada Grain Act, The Feeding Stuffs Act or the regulations thereunder so as to prohibit the sale or offering for sale in Ontario of those classes now designated as "uncleaned screenings" and "refuse screenings", and to prohibit the mixing of such classes with any other feeds, and

The appropriate federal and provincial departments should accelerate a program of research designed to destroy the viability of weed seeds going into feeds or feed mixtures. P.179.

CHAPTER 1

TERMS OF REFERENCE

The resources of Ontario are highly diversified and are capable of use or enjoyment in many different ways. Appointed to study all aspects of conservation, the Committee found itself necessarily concerned with three primary or basic resources: soil, water and wood. A conservation program for Ontario must be founded upon the wise use of these three resources, with due regard for their maintenance and for the economic and social needs of the people who inhabit this Province.

Soil, water and wood are closely interrelated, both in the processes of wastage and the processes of renewal. Whether they are dissipated or maintained depends on a multitude of factors which will be discussed in this report. Among the most important factors is the degree of understanding and knowledge of the proper principles of land use which may be found in government, in the scientists and technicians, in landholders and in the general public.

To discover and apply the principles of land use, it is first necessary to know the character and distribution of natural resources throughout the Province, and to evaluate them. Secondly, it is necessary to consider the practices in vogue since Ontario was settled, and to estimate their results. Thirdly, we have to relate the findings of science and experience to present practices and to recommend whatever changes are indicated.

In this inquiry the Committee first called upon senior officials of almost all Departments of the Ontario Government and the Hydro-Electric Power Commission. From them a large body of information was obtained. The Committee then toured the Province, held hearings for every county and district, receiving valuable information and advice from a very large representation of municipal, agricultural and other

groups. At other hearings the Committee heard briefs from a number of provincial organizations and several universities. From time to time assistance was obtained from many individuals specially qualified to counsel the Committee, both in Ontario and elsewhere.

The whole inquiry made it clear that the ramifications of the conservation problem extend into innumerable areas of activity, both public and private. Of special importance - and therefore deserving special mention - are research, education and extension. Without these we cannot call upon the resources of science to help us manage wisely the resources of nature. Scientific research in agriculture, hydrology, forestry and all related fields, is of ever-increasing importance. Education not only influences the public but provides the scientists and research workers, extension men and agricultural leaders without whom we cannot succeed. Extension is indispensable, for it maintains a transmission belt of knowledge from the storehouse of science to the individual citizen on the land who actually applies the principles of land use.

In the light of these considerations the Committee has endeavoured to formulate appropriate recommendations under its terms of reference. The Committee is conscious that the limits of knowledge are constantly widening and that more will become known from year to year. At the same time the Committee believes it is necessary to initiate now a long-range program of conservation for Ontario, recognizing that it must be subject to review and improvement as experience may demand.

CHAPTER 2

ITINERARY OF THE COMMITTEE

The work of the Committee naturally fell into three periods:

- (a) the gathering of all evidence relative to the terms of reference;
- (b) the review and consideration of such evidence;
- (c) the formulation of conclusions and preparation of this Report.

To gather all evidence on a subject that has so many ramifications necessitated visits to centres throughout the entire Province so that all persons and organizations would have an opportunity to express their views and recommendations. Arrangements were made through the field officers of the Departments of Agriculture and Lands and Forests to notify all local groups and persons to prepare and present briefs on any phase of conservation. In some instances it was found possible for several counties with similar problems to form a combined committee which prepared one brief on behalf of many organizations. This greatly facilitated the hearings and provided more time for discussion. It was further made clear that all hearings were to be of a public nature and that any person or organization whatever could submit briefs and participate in the discussion.

The Committee was aware of the role the Press could play in bringing these hearings before the general public. Accordingly all daily, weekly and farm press organizations in the Province with a circulation of 2,000 or more were advised of the Committee's itinerary. The Press provided excellent coverage which increased public awareness of the issues of conservation.

Public hearings commenced on July 19, and were held intermittently until November 30. It is significant

that in the midst of the haying and harvest season some sittings were attended by as many as 200 interested people, who, despite the urgency of work at that season, spent a day or an afternoon in lively discussion.

The Committee travelled approximately 6,000 miles to hold 55 meetings throughout the Province, at which 116 organizations and individuals presented briefs. These are listed at the conclusion of this report.

A program that has drawn considerable attention as an example of a co-ordinate approach to conservation is the Muskingum Conservancy District in Ohio. The Committee spent two days in studying this significant project and fully discussed its history and administration with its officers. The Committee also visited Mr. Cosmes Blubaugh, one of the pioneer farmer-conservationists of America. A valuable meeting was held with the distinguished author, Mr. Louis Bromfield, at Malabar Farm, on which occasion it was arranged to have Mr. Bromfield visit Ontario.

The Committee in November spent two days in the northern clay belt area of the Province of Quebec near La Sarre for the purpose of studying the colonization scheme sponsored by the Government of that Province.

To review and consolidate the multitude of submissions presented to this Committee proved to be a formidable task. It was natural and desirable that some submissions dealt with local problems and consequent local proposals. It was the duty of the Committee, however, to formulate recommendations that were in the main of provincial scope. The attempt has been made to present as much reasoning in support of such recommendations as time and space permit.



Sheet, rill and gully erosion soon destroy the productivity of the soil. Land without vegetative cover over the winter suffered this damage in a few days in the 1949 spring thaw. The open winter of 1950 has resulted in even greater soil losses.

SOIL

CHAPTER 3

SOIL EROSION IN WORLD HISTORY

Soil erosion is part and parcel of the story of mankind. Life depends on food and therefore on productive land. Wherever climate and vegetation had laid down a few inches of topsoil, man began to multiply. Each and every civilization has been poised precariously on this thin, life-giving carpet. It covers only a small part of the earth's surface, yet without it humanity would be reduced to a few bands of nomadic fishermen and hunters.

Great empires have risen and flourished only to fall with the loss of their topsoil. Ancient cities of wealth and culture now lie buried beneath drifting sands. Countless wars and famines bear witness to the potent role of soil erosion in world history. The destruction of the atom bomb is sudden, swift and spectacular. With its silent, creeping power soil erosion has been causing far more terrible and lasting devastation for many centuries past.

The abundance of food in North America during the last 100 years was made possible by the application of efficient modern tools to a rich topsoil - the legacy from ages of forest growth and luxuriant grasses. Where this topsoil is conserved by sound agricultural practices it continues unimpaired to yield bountiful crops, and will continue to do so indefinitely. Where it is eroded, production declines in both quality and quantity, sometimes slowly, sometimes quickly, but ever downward. Erosion was not taken very seriously until recent years, but only because we overlooked or misunderstood the lesson of history.

Mesopotamia was the cradle of European agriculture. Five thousand years ago the valley of the Tigris and the Euphrates was an extraordinarily productive area, giving rise

to the belief that it contained the Garden of Eden. When men multiplied they cut off the forests at the headwaters of these rivers. Irrigation ditches spread water and sediment over the valley, gradually raising its height. In consequence, the rivers flooded and changed their course. Control of the irrigation system was lost, pastures were over-grazed, topsoil was washed out to sea, shifting the shoreline 200 miles to the south. Deprived of moisture, vegetation and topsoil, most of the area was surrendered to the wind, the sand and the desert. Before erosion dropped its long-term bomb the valley supported ten times as many people as it does today.

The eastern shores of the Mediterranean were originally protected by forest. Great trading ports like Antioch were markets for upland agriculture. There were some attempts at terracing the slopes to avoid erosion, for which the Phoenicians deserve credit. The remains of irrigated terraces can still be found around Carmel, Gilboa and Samaria, all renowned for fertility in ancient times. Similar practices in the grainfields and olive-groves of Palestine made it highly productive for a long period. Early in the Christian era both Palestine and Syria were occupied by invaders who practised exploitive agriculture. Trees were cut, reservoirs and ditches neglected or destroyed. Soil washed quickly from the steep slopes and devastation ensued. From being one of the richest the area soon became one of the poorest in the world.

Similar stories could be told of the Persian, Egyptian and Carthaginian civilizations. At one time the North African coast was regarded as the granary of the Roman Empire. When irrigation works were damaged by war, vegetation disappeared, blowing sand and subsoil covered whole cities, the work of seven centuries was lost in less than 100 years. In other North African regions the humus was destroyed by cultivation, particularly by improper plowing; windstorms converted farm fields into sand dunes, thus artificially extending the Sahara desert - permanently unfit for cultivation.

Some authorities also hold that centuries of irrigation lowered the water-tables to the point of exhaustion, thus making irrigation itself impossible.

The Greek civilization has had an influence second to none of ancient times. First as a pastoral people, then as farmers and traders, the Greeks grew in numbers until by the ninth century B. C. their land problem was acute. Ever short of grain, they let their land deteriorate under intensive cropping. In the fifth century B. C. the shrewd writer Xenophon made handsome profits by purchasing worn-out old farms, restoring them and reselling later. Generally the Greeks seem to have misunderstood their problem. Theophrastus said: "It is the weather rather than the soil that determines the harvest". He was stating with Greek clarity one of the most profound and most persistent fallacies in all history. Erosion on the sloping lands of Greece continues to this day.

The Romans began as farmers and showed considerable interest in agricultural practices. Pliny in the first century A. D. praised the straight furrow but also suggested contour work and terracing on hillsides. The Romans knew the value of lucerne or alfalfa, and other legumes, both as a forage crop and as fertilizer. Virgil mentioned a simple rotation, fallow, grain and legume. However, the empire spread, population grew, Roman farmers could not compete against cheap grain from the colonies and the land was allowed to deteriorate. Most of it was doomed by the early part of the Christian era, and so was the Roman Empire. The scarred farmlands of modern Italy were noticed by many Canadians in World War II.

England was being farmed by the Celts before Caesar's legions arrived. On the uplands the Celtic fields were square, laid out in checker-board fashion, not unlike many a township of Southern Ontario. Roman methods modified but did not replace the Celtic system. The square fields, with ditches developed by plowing and washing lent themselves to erosion. By the time of the Saxons they were useless and many were

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abandoned until the Battle of Britain, 1500 years later.

Saxon agriculture was concentrated in the lowlands, with long narrow fields, leaving the eroded uplands to pasture. It was succeeded by the manorial open-field system and a prolonged period of low yields. In the 18th century husbandry was improved, but overgrazing and other evils continued to cause heavy losses by erosion in both England and Scotland. As Britain became a great industrial and trading power, food was imported in ever-increasing quantities, and agriculture was neglected until recent years. The struggle for self-sufficiency has changed the whole picture. Britain has the advantage of a mild climate and a gentle rainfall distributed throughout the year.

In the Western Hemisphere ancient Peru presents a striking example of intelligent soil conservation. The Incas built elaborate terraces on their steep slopes, realizing that otherwise the soil would wash down into the narrow valleys of their country. They irrigated the fields with stone aqueducts from terrace to terrace. Sometimes they imported precious topsoil. At great labor cost their methods were successful.

For different reasons the rice-farmers of southern China built tiny terraced fields, fully irrigated. As each field was enclosed by banks of soil the water loss was nil or negligible. Extraordinary fertility was maintained by conserving every ounce of manure and nightsoil as fertilizer. An irrigated area like the Chengtu Plain has produced heavy crops without fail for 1500 years, thanks to fertilizer, rotations, abundant moisture and the absence of erosion.

On the other hand, northern China and the Gobi Desert presented one of the most spectacular exhibits of soil erosion in the world. Lacking moisture, over-grazed by nomadic herds-men and exposed to violent weather, the northwest has become an almost lifeless waste of rock and sand. Across the plains of Northern and Central China the Yellow River and the Yangtze wander their uncontrollable ways. The former is known as

"China's Sorrow" because it frequently changes course in flood, destroying thousands of acres and thousands of lives. The real tragedy is that both rivers annually carry millions of tons of rich topsoil out to sea, staining the Pacific chocolate brown for hundreds of miles and dooming generations of unborn Chinese to death by famine.

There has never been a more striking paradox of productivity and erosion than the story of agriculture in the United States. If this be thought exaggerated - coming from Canadians - then the story can be summarized in the words of a distinguished American authority ¹.

"When our forefathers came to America, they found unbelievable riches in soil, forest, mineral and other natural resources. It was inconceivable to them that such wealth of land and productivity ever could be used up. Looking back, we are able at least to understand why our forefathers pursued a policy of plow up, wear out, and move on. It was the easiest thing to do, in a day when farming under the best circumstances was much more arduous than it is today; when soil erosion was little comprehended generally, and was not active on the lands being cleared; and when virgin soil was plentiful close at hand.

"It has been common practice in many areas of the United States for our farmers to clear and cultivate sloping lands for a few years, until it no longer produces good yields; then abandon the field and repeat the process on new lands. No thought was given to why the land was 'worn out', as the farmer said. There was little recognition of the fact that the fertile topsoil had been washed away, leaving only the sub-soil which could not produce crops with profit. There was no realization of the destruction being wrought to the natural heritage of succeeding generations.

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Lewis A. Jones, Chief of the Division of Drainage and Water Control, Soil Conservation Service, U. S. Department of Agriculture, in a paper delivered to the Agricultural Institute of Canada at Guelph, June 22, 1948.

"In the past 150 years, half or more of our farm land has been damaged by erosion, and millions of acres have been ruined for any further immediate cultivation. We have the unenviable record of having permitted our land to undergo depreciation and wastage at a faster rate than any nation we know anything about. As a result, we now have only about 460 million acres of high-grade crop land. And all but about 100 million of this 460 million acres is subject to erosion or other forms of depletion when used without adequate safeguards. Our Soil Conservation Service estimates that even today we are still allowing an aggregate of about 500,000 acres of our crop land to be so damaged by erosion every year that it no longer can be cultivated profitably. I am glad to state, however, that during the past 20 years the people of the United States, both rural and urban, have been brought to some realization of what is happening and that steps are being taken to correct the situation".

Among the principal causes of erosion in the United States have been: overgrazing on western range lands; continuous ploughing of windswept prairie soil until the "dustbowl" appeared; continuous cultivation of corn, cotton and other cash crops, particularly in the South; insufficient fertilizer; wastage of barnyard manure; intensive cultivation of hilly lands, ploughing and cultivating up-and-down the slope instead of across the slope; clear-cutting trees and woodlots; leaving land in bare fallow, unprotected from the weather; improper drainage; burning straw and other valuable organic matter; floods and the violent extremes of weather which characterize the climate over most of North America.

There is little or no possibility of controlling the weather. Floods are in a different category. Much attention has been given to the Mississippi River, which just goes rolling along, carrying vast quantities of soil to extend the delta at its mouth or to find a resting-place at the bottom of the Gulf of Mexico. The Mississippi, like other rivers, is not

as guilty as it appears to be. Much of the topsoil it carries away should never have reached the river. It would have remained on distant farms, where it belongs, if erosion had been prevented at the starting-point of erosion. Almost every ounce of topsoil which goes out to sea once had its home on a certain spot of a certain field of a certain farm.

It is for this reason that the U. S. Soil Conservation Service has concentrated its efforts to stop soil erosion at the starting-point, on the farm. This campaign of course has been waged on a broad front, including research, surveys, demonstrations, co-operation with local groups and local governments as well as the individual farmer, education and propaganda. In addition the Soil Conservation Service has engaged actively in the purchase of submarginal lands, flood control, irrigation projects, drainage and farm forestry.

The program of the U. S. Soil Conservation Service is a very costly one, entailing the expenditure of many hundreds of millions of dollars. If this be thought extravagant by Canadian standards, it is well to remember three distinctive features of the American problem:

(a) The stakes are high. With a population well over 150,000,000 to be supported at a high standard of living, the Americans cannot afford to let thousands of farms go out of production each year. In a long-range sense present food surpluses are illusory.

(b) The rapidity of settlement and expansion, the intensity of cultivation and production, the efficiency of modern implements combined to take the United States more swiftly down the slippery road than any other nation in history. The situation had already become so desperate by 1934 that desperate measures were necessary to halt erosion. In other words, high-powered brakes were needed for a high-powered machine going downhill fast.

(c) Public demand, stimulated by widespread alarm and discussion, called for strong action.

Dr. Hugh Bennett, Chief of the Soil Conservation Service, gives this graphic account of the great American
(2)
Awakening:

"Outside a few localities in the United States where the problem of erosion literally forced its attention on land users, as in parts of the Cotton Belt, little or no recognition was given the problem, and practically nothing was done about it. Some awakening came, finally, through an educational and investigational program inaugurated by the United States Department of Agriculture and some of the states, about 12 years ago. Then, on May 12, 1934, the nation witnessed a disturbance that was completely without precedent in American history. Dust clouds arising over sun-parched fields in western Kansas, Texas, Oklahoma, and eastern Colorado, were lifted into the pathways of high air currents and carried eastward across two-thirds of the continent. Soil from the Great Plains, for the first time since the coming of white man, darkened the sun over the nation's capital, sifted through the screens of tall office buildings in New York City, and moved on for hundreds of miles over the Atlantic Ocean. People on the eastern seaboard were shocked into a realization that something had gone wrong with the land to the west. All over the country, people began to inquire about this new phenomenon and to discuss its significance.

"Since that time, thousands of newspaper stories and magazine articles have been written about soil erosion. The subject has been treated on public platforms and over the radio. Motion pictures have brought the story with amazing effectiveness to even the most strictly urban communities. Meanwhile, governmental, scientific, and educational institutions have been actively searching for further knowledge about the character and extent of erosion damage. The United States Department of Agriculture, state colleges of agriculture, and state agricultural experiment stations have brought forth a wealth of new

(~) Bennett: Soil Conservation, p.55

information about this process which a little while ago was so little understood. Contributions to the science of soil erosion are now coming from many parts of the world. Today it is possible to formulate a statement of the soil erosion problem in more accurate terms - in terms quite different from those which would have been used a decade ago.

"Soil erosion is now generally recognized in the United States as a powerful and destructive force which, directly or indirectly, affects the lives of every man, woman, and child. It is understood now not as a freak of nature which occasionally turns up on isolated farms and ranches but as an almost continually active process which attacks countless fields, whole watersheds, and broad farming communities. Some evidence of its damaging effects has been discovered over an area comprising approximately a billion acres of crop, grazing, forest, and abandoned lands of continental United States. It has extended into nearly every major farming region and has affected, in some degree, the production of nearly every staple crop as well as many specialty crops. Erosion and eroded lands have introduced a relatively new and disturbing factor into the whole complicated cycle of water circulation, drainage, and storage".

As Dr. Bennett suggests, soil conservation has attained a new status. It has become a science based on experience and experimentation in all parts of the world. We possess at least this advantage over previous civilizations: we have the privilege of knowing what soil erosion is, and why; we have the opportunity of learning how to correct it and how to leave the land as good as, or better than, we find it. This is surely an obligation to ourselves and to all those who come after us.

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








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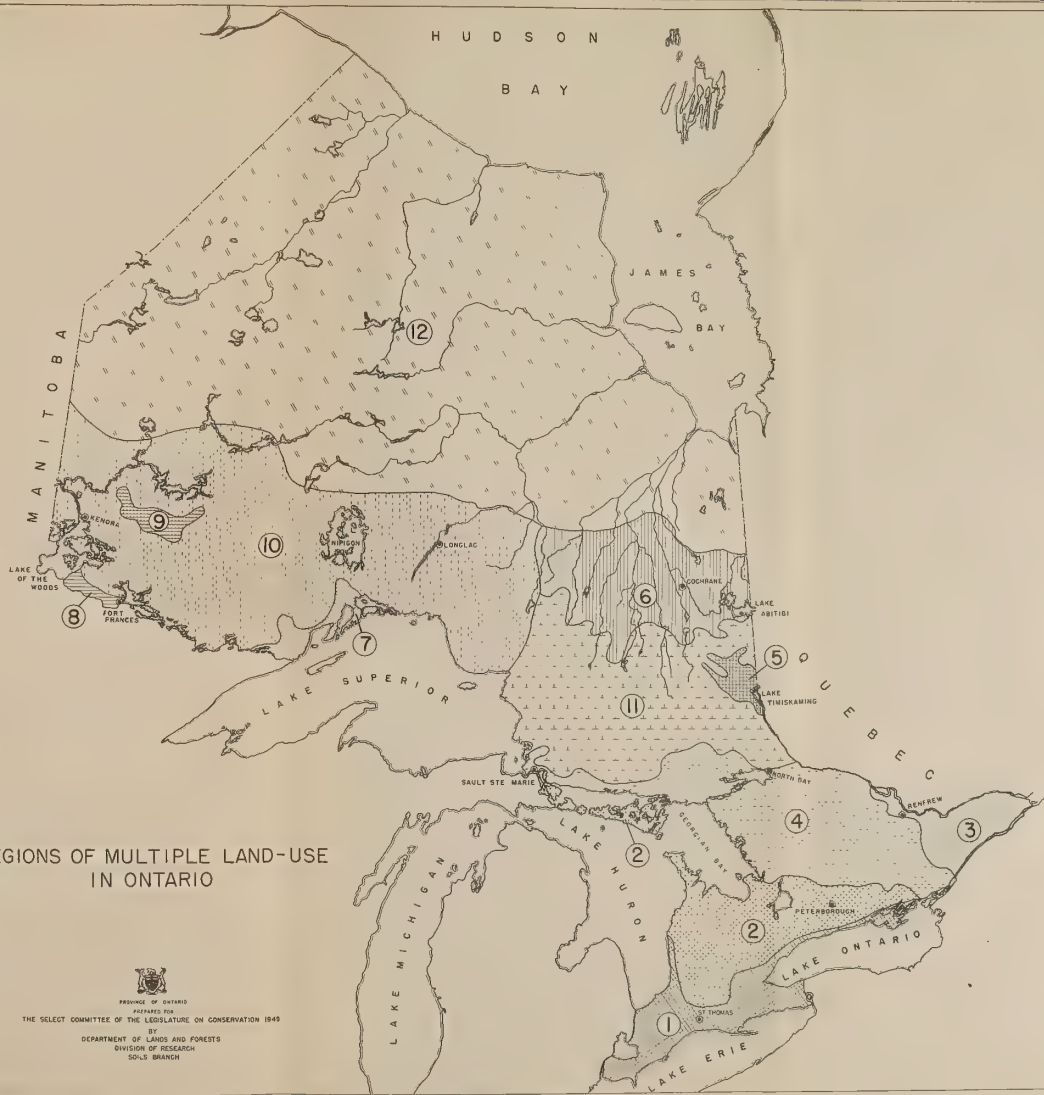
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MULTIPLE LAND-USE OF ONTARIO'S RENEWABLE RESOURCES ON A REGIONAL AND LOCAL BASIS

SYMBOL	REGION	COMMON LAND FORM	CLIMATIC HAZARD	NATURAL SOIL CHARACTERISTICS	PRESENT LAND — USE	RECOMMENDED LAND-USE			
						AGRICULTURE	FORESTRY	FISH AND WILDLIFE	RECREATIONAL
	SOUTHERN GREAT-LAKES SLOPES	SMOOTH LAKE PLAIN, MODERATELY TO STRONGLY DISSECTED BY STREAM COURSES	VERY LOW	EXCELLENT TO GOOD TILTH AND FERTILITY READILY ESTABLISHED	SPECIALIZED AGRICULTURE. GENERAL FARMING SUBURBAN DEVELOPMENT	INTENSIVE DEVELOPMENT IS RECOMMENDED	LOCALLY OF MAJOR IMPORTANCE IN CONTROL OF EROSION, AND IN LANDSCAPING IMPROVED AND BETTER-LOCATED WOODLOTS, WIND-BREAKS AND GREEN BELTS ARE NEEDED.	LOCALLY OF MAJOR IMPORTANCE IN BALANCED LAND-USE. EXTENSION OF FISH AND WILDLIFE MANAGEMENT IS RECOMMENDED	LOCALLY OF MAJOR IMPORTANCE IMPROVED FACILITIES FOR THE GENERAL PUBLIC IS RECOMMENDED
	SOUTHERN TILL UPLANDS	ROLLING MORAINES WITH LOCAL LAKE PLAINS AND LIMESTONE AREAS	LOW	VERY GOOD TO GOOD TILTH AND FERTILITY FAIRLY READILY ESTABLISHED	GENERAL FARMING, GRAZING SPECIALIZED FARMING SMALL FOREST TRACTS	MORE INTENSIVE DEVELOPMENT IS RECOMMENDED	LOCALLY OF MAJOR IMPORTANCE IN CONTROLLING EROSION AND IN SUPPLEMENTING RURAL INCOME. IMPROVED FOREST TRACTS WOODLOTS AND SHELTER BELTS NEEDED.	LOCALLY OF MAJOR OR AT LEAST SECONDARY IMPORTANCE IN PROVIDING A BALANCED LAND-USE	LOCALLY OF MAJOR IMPORTANCE IMPROVED FACILITIES FOR THE GENERAL PUBLIC NEEDED
	SOUTH EASTERN LOWLANDS	SMOOTH MORAINES, LAKE AND MARINE PLAINS, LIMESTONE PLAINS.		GOOD TO POOR	FORESTS PART-TIME FARMING GENERAL FARMING TOURIST RESORTS WASTE LANDS	LOCALLY OF MAJOR IMPORTANCE EITHER AS A PRIMARY INDUSTRY OR COMBINED WITH FORESTRY, WILDLIFE MANAGEMENT OR TOURISM	FOREST MANAGEMENT URGENT TO MAINTAIN STREAM LEVELS, PREVENT SOIL DRYING AND EROSION AND TO PROVIDE INCOME FOR RURAL RESIDENTS.	MANAGEMENT OF FISH AND WILDLIFE INTEGRATED WITH FORESTRY AND FARMING IS RECOMMENDED.	EXTREMELY IMPORTANT IN THIS REGION. THOROUGH INTEGRATION WITH FARM, FOREST, AND WILDLIFE HUSBANDRY WITHIN ORGANIZED COMMUNITIES IS RECOMMENDED
	ALONGQUIN AND NORTH-HURON SHORE	ROLLING ROCKY UPLANDS WITH POCKETS OF CLAY AND SAND	MODERATE TO HIGH	TILTH & FERTILITY FAIRLY READILY ESTABLISHED TO ESTABLISHED WITH DIFFICULTY	GOOD TO FAIR	MORE INTENSIVE DEVELOPMENT FOR AGRICULTURAL AND FOREST CROPS.	LOCALLY OF MAJOR IMPORTANCE FOR INCOME OF RURAL RESIDENTS OF MANY COMMUNITIES.	INTENSIFICATION OF FISH AND WILDLIFE MANAGEMENT ON FOREST AND SWAMP LAND IS RECOMMENDED.	DEVELOPMENT OF GOOD TOURIST AND HUNTING CAMPS IS RECOMMENDED
	TEMISKAMING CLAY BELT	UNDULATING CLAY PLAIN BROKEN IN PLACES BY ROCK RIDGES.	MODERATE TO MODERATELY HIGH	TILTH & FERTILITY FAIRLY DIFFICULT TO ESTABLISH	GENERAL FARMING, PART-TIME FARMING, SCRUB FOREST GROWTH, LOCAL FOREST TRACTS	MORE INTENSIVE DEVELOPMENT FOR AGRICULTURAL AND FOREST CROPS.	LOCALLY OF MAJOR IMPORTANCE FOR INCOME OF RURAL RESIDENTS OF MANY COMMUNITIES.	INTENSIFICATION OF FISH AND WILDLIFE MANAGEMENT ON FOREST AND SWAMP LAND IS RECOMMENDED.	DEVELOPMENT OF GOOD TOURIST AND HUNTING CAMPS IS RECOMMENDED
	COCHRANE CLAY BELT	UNDULATING CLAY PLAIN	HIGH	FAIR TILTH AND FERTILITY DIFFICULT TO ESTABLISH	FORESTS (EXCEPT IN SETTLEMENT AREAS) LOCAL AREAS OF GENERAL FARMING	INTENSIVE DEVELOPMENT OF THE BETTER LANDS ALREADY OPENED FOR SETTLEMENT.	MANAGEMENT OF FORESTS NEEDED IN BOTH FOREST AND SETTLEMENT AREAS	FREQUENTLY OF PRIME IMPORTANCE TO SUPPLEMENT SETTLER-INCOME.	OF LOCAL IMPORTANCE. DEVELOPMENT OF GOOD TOURIST AND HUNTING CAMPS IS RECOMMENDED
	LAKEHEAD RIDGES AND POCKETS	CLAY TERRACES AND SAND FLATS BROKEN BY ROCKY RIDGES	MODERATELY HIGH	GOOD TO FAIR TILTH & FERTILITY FAIRLY DIFFICULT TO ESTABLISH	LOCAL AREAS OF GENERAL FARMING AND OF MERCHANTABLE FOREST.	INTENSIVE DEVELOPMENT OF BETTER LANDS IS RECOMMENDED LIMITED EXTENSION OF FARMING COMBINED WITH FORESTRY, WILDLIFE AND TOURISM.	IT IS RECOMMENDED THAT FORESTRY BE PRACTICED IN COMBINATION WITH FARMING IN BROKEN AREAS	MANAGEMENT OF FISH AND WILDLIFE INTEGRATED WITH FORESTRY AND FARMING IS RECOMMENDED	EXTENSION OF TOURISM DEVELOPMENT IS RECOMMENDED
	RAINY RIVER CLAY PLAIN	UNDULATING CLAY PLAIN LOCALLY BROKEN BY ROCKS AND RIDGES	MODERATE	GOOD TILTH AND FERTILITY ESTABLISHED FAIRLY READILY	PART-TIME FARMING, GENERAL FARMING SCRUB AND MERCHANTABLE FOREST.	MORE INTENSIVE DEVELOPMENT, BOTH AS A PRIMARY INDUSTRY AND COMBINED WITH FORESTRY, IS RECOMMENDED.	IT IS RECOMMENDED THAT FORESTRY BE PRACTICED IN COMBINATION WITH FARMING IN BROKEN AREAS.	LOCALLY OF MAJOR IMPORTANCE	DEVELOPMENT (IMPORTANT RECREATIONAL LANDS ADJOIN BUT NOT WITHIN THE CLAY PLAIN)
	DRYDEN CLAY PLAIN	ROLLING CLAY AND ROCK RIDGES	MODERATELY HIGH	FAIR TILTH AND FERTILITY DIFFICULT TO ESTABLISH	SCRUB AND MERCHANTABLE FOREST GENERAL FARMING VERY LOCAL.	NO EXTENSION OF PRIMARY AGRICULTURE IN NEW AREAS IS RECOMMENDED UNTIL BETTER LANDS OF THIS AND OTHER REGIONS ALREADY OPENED ARE WELL DEVELOPED	IT IS RECOMMENDED THAT FORESTRY BE PRACTICED IN COMBINATION WITH FARMING IN BROKEN AREAS.	LOCALLY OF MAJOR IMPORTANCE TO SUPPLEMENT SETTLER-INCOME.	EXTENSION OF DEVELOPMENT IS RECOMMENDED
	NORTHWESTERN UPLANDS	ROLLING ROCKY UPLAND WITH RIDGES OF LIMY SAND AND CLAY PLAINS	MODERATELY HIGH TO HIGH	FAIR TO POOR LEACHED SOILS AND MUSKEGS	FORESTS WIDELY DISPERSED COMMUNITIES OF A FEW PART-TIME FARMERS TOURISM LOCALLY WELL DEVELOPED.	LIMITED DEVELOPMENT OF LOCAL AREAS OF BETTER LAND FOR FARMING, COMBINED WITH FORESTRY, WILDLIFE AND TOURISM IS RECOMMENDED.	FOREST MANAGEMENT URGENT	MANAGEMENT OF WILDLIFE AND FISH URGENT.	LOCALLY OF MAJOR IMPORTANCE AS IN LAKE OF THE WOODS AND LAKEHEAD AREAS. EXTENSION OF DEVELOPMENT IS RECOMMENDED.
	SUPERIOR-HURON UPLANDS	ROLLING ROCKY UPLAND WITH SCRIPPLED RIDGES AND VALLEY FLATS OF ACID SOILS	HIGH TO VERY HIGH	POOR LEACHED SANDY AND STONY SOILS, GENERALLY SHALLOW OVER BEDROCK	FORESTS GAME FUR AND FISH, TOURISM (VERY LOCAL)	NOT RECOMMENDED FOR AGRICULTURAL SETTLEMENT	FOREST MANAGEMENT URGENT	MANAGEMENT OF WILDLIFE AND FISH URGENT	EXTENSION OF DEVELOPMENT IS RECOMMENDED
	NORTHERN COASTAL PLAIN AND UPLANDS	OPEN BOGS LOW ROCKY RIDGES AND MUSKEGS	EXTREMELY HIGH EXCEPT ALONG ESTUARIES AND COAST	VERY POOR MUSKEGS AND BOGS EXTREMELY DIFFICULT TO DRAIN OR RECLAIM	TRAPPING AND HUNTING FORESTS OCCUR LOCALLY IN STREAMS AND RIDGES. WASTES	NOT RECOMMENDED FOR AGRICULTURAL SETTLEMENT.	LIMITED TO STREAM BANKS AND LOW RIDGES.	EXTENSION OF PRESENT WILDLIFE MANAGEMENT	LIMITED EXTENSION IS RECOMMENDED



CHAPTER 4

MAJOR GEOGRAPHIC REGIONS OF ONTARIO

Land can be compared to a carpet or rug which covers a large part of the surface of the globe. Into a warp of sand, silt, clay and undersurface water, the woof of climate is interwoven to form soil and vegetation patterns. These natural land patterns determine the crop or crops which can be produced, crops not only of the field, orchard and pasture, but crops of the forest and stream. These patterns also control the yield and quality of these crops although much also depends on how man cooperates with nature in the management of land. Just as the coat should be cut according to the cloth, so should land use be guided by natural land patterns. Not only should local variations in the soil of a farm or a community be considered but a natural grouping of patterns having similar qualities and uses into multiple use regions should provide the broad framework for the development of renewable resources.

It is not surprising that in so vast an area as the Province of Ontario, with its 232,500,000 acres stretching from the mild climate of Essex County (sometimes jocularly called the "Banana Belt") to the semi-tundra of Northern Patricia, there are at least 11 regions of major importance.

The development of most of these regions is dependent not upon a single economy or land use but upon a combination economy or multiple land use. Even in Southern Ontario, long considered a region of primary agriculture, there are many areas where there is need for a balanced land use which includes forestry and wildlife management. It is too much to expect then that all regions in the north can be developed for primary agriculture. Some may never be highly developed, others, because of economic factors, will not be developed for a long time, and in the meantime can contribute greatly to our provincial economy through a well integrated program of all-crop husbandry.

Like carpets or rugs, land patterns will appear lustrous if used wisely but will tarnish with abuse. The injudicious cutting and burning of the vegetative cover, the over-grazing of pasture lands, the poor tillage of farmland and the other abuses of land carried on continuously and intensively will not only destroy the local pattern but will weaken the fabric of adjoining patterns. Conversely the wise use of adjoining patterns may facilitate a higher use of some closely associated areas than would be possible otherwise. For instance the intensive use of a large proportion of an area for a combination of forestry, wildlife management and recreation could render profitable the agricultural development of suitably located lands within the area which would otherwise be regarded submarginal for agriculture. Since land is an entity or whole, the wise use of land must be considered not in parts alone but as a whole. It must be considered in terms, not of single communities nor yet of individual regions, but of provinces, of nations, and of the whole world. Neither should settlement of an area be considered in terms of a single economy but rather in terms of multiple land use.

The following survey is therefore an attempt to present each region in its proper perspective in relation both to other regions and to the component parts of the region itself. It is important to understand the relative potentialities which the region has as a whole as well as those of its several parts. What may be a major land use for a local area may be a minor land use for the region as a whole, yet the local area because of its diversity may contribute much to the whole.

1. The Southern Great Lakes Slopes

The characteristics which set apart the region of the Southern Great Lakes Slopes from the remainder of agricultural southern Ontario are:

(a) The general over-all smooth topography. The geological materials have been deposited either in glacial

lake beds or have been subsequently planed by wave action.

(b) Local areas deeply and frequently dissected by streams with steep gradients flowing into the Great Lakes.

(c) Most favourable climate and soil conditions.

It is natural then that this region should become one of specialized agriculture and since it is also the region of greatest manufacturing development, it has become a region of suburbs. High land values render essential the most intensive use of land which is possible, in keeping with good conservation practice. Because there are areas in this climatically favourable region which are used for permanent pasture or allowed to lie idle, it has been suggested that many of these lands should be forested. This fact is forcibly brought home when foresters employed by pulp companies ask, for example "Will the almost abandoned clay lands of the Niagara Peninsula grow good pulpwood?". The excellent rate of growth of forest trees in these areas apparently makes their production an attractive proposition.

However, the potential of much of the poorer and little used lands is such that great care should be exercised before embarking on a long-term policy of growing trees. This would limit the role of forestry to small areas, small woodlots, green belts and other park lands and the control of erosion at strategic points. In this region forests may be necessary for conservation purposes without regard to net returns. For example, areas of drifting sand which jeopardize valuable land adjacent to them must be reforested, whether or not forest production will justify the cost. Generally, however, the revenue from timber alone eventually pays for the establishment of such forests.

In this region it is not a question of arbitrarily maintaining 15 or 20 per cent of the area in forests. It is a question of whether erosion cannot be controlled more economically by improved methods of farm crop production

rather than by reforestation. The Peel Plain for instance, has been cited as an example of a desiccated area requiring reforestation to control erosion and maintain water levels. It would seem more practical in this and other areas of high agricultural potential to control erosion through sound farm practices, often resulting in increased production. Of course, the reforestation of the poorer grades of land in the same watersheds as these arable lands could assist in maintaining better water levels in the farming area. Much depends on the types of land and their pattern of distribution.

2. Southern Till Upland

The Southern till upland is a region of rolling hills and undulating plains of till and limestone bedrocks broken by numerous swamps both large and small. The steep slopes which break the continuity of farmland in this area are not those formed by eroding streams but rather those of morainic hill-sides and of escarpments of limestone, sandstone and shale.

Though specialized farming is an important land-use in this region it is greatly overshadowed by dairying and other general farming practices. The large areas of shallow soils over limestone determine that a relatively large proportion of this region must be devoted to pastures or forests.

Because of the broken nature of this region, forests are a more logical means for erosion control than in region 1. This means that though much land should remain in farm crops, the acreage of farmers' woodlots should be increased and forest tracts extended. In the extension of forest tracts care should be exercised to see that these remain part of the economy of rural communities so that rural husbandry can eventually include the care of the forest as well as that of the fields and pasture. Trees, as well as other crops, require the attention of farmers so that it is unnecessary to make any drastic shifts of rural inhabitants.

3. South-Eastern Lowlands

This lowland region lying between the Ottawa and St.



There are large areas of poorly drained bogs in Eastern Ontario which at present are not economical for agriculture yet are producing little or no forest crops.

Lawrence Rivers is similar to Region 1 in that it is a levelled plain which has been covered deeply by water. The body of water in this case was an inland arm of the sea although its marine deposits are similar in many respects to lacustrine deposits of South Western Ontario. In most respects however it resembles Region 2 with its limestone plains, its large areas of till, modified but little by wave action and by its climate, which is generally less favourable than that of the Southern Great Lakes Slopes and in local areas even less favourable than that of Region 2, with the exception of the Bruce Peninsula and Manitoulin Island.

In the matter of land use, both present and recommended, this region so closely resembles Region 2 that the remarks which were made above for that region apply as well to Region 3.

4. Algonquin Uplands and North Huron Shore

This is a large region comprised of many and varied local subregions and pockets. It stretches from the Ottawa River between Pembroke and Mattawa westward to Georgian Bay, northward to the Lake Nipissing pockets and westward to Sudbury and the ridges and valleys of the North Huron shore terminating some distance north of Sault Ste Marie.

It is predominately "Canadian Shield" country, a rolling upland of rock knobs and basins intersected by the steeper faces of fault lines. Scattered along the broad flats and narrow rocky trenches (such as occur in the Ottawa Valley and in the Nipissing-Mattawa areas) there are deeper materials laid down by ice and lake waters which have a higher potential for crop production than the shallow sandy soils which dominate the upland areas. However the areas of clay and loam soil which are not badly broken by rock outcrops, eroded stream courses, swamps or sand ridges are seldom larger than a township or two and occur at widely separated points. The total acreage of fair to good lands is small, approximately 600,000 acres or four per cent of the total land area.

On these widely separated areas of better lands, fairly good agricultural communities have developed such as those in the vicinity of Vilno, Bracebridge, Huntsville, Powassan, Rutherglen, Sturgeon Falls to Noelville, Chelmsford, Thessalon, Bruce Mines, Bar River and Sault Ste. Marie. These areas, though comprising a very small fraction of the whole region, are very important -- first of all as areas of primary agriculture, but more particularly because they are the nuclei for an economy of combined agriculture, forestry, wildlife management and recreation. Evidence of the necessity of such an economy is provided by the fact that many of the better lands have been practically abandoned when a living could no longer be made from adjacent forests.

The soils of the remaining 96 per cent are so stony or of such coarse materials or so poorly drained that the cost of maintenance is prohibitive except under an economy vastly different from that we have at present. However there has been considerable settlement on these poor, stony, sandy soils, many of which have insufficient depth over bedrock. That such areas were opened up is due largely to the disguise which the maple forest provides for these shallow sandy soils. What appears to be a rich dark chocolate-loam when under forest becomes a dry barren cinnamon-brown sand when cultivated.

Though the better agricultural lands are also the better timber sites, good timber (pine for example) has grown on soils too light or too shallow for the economic production of agricultural crops. Boulders do not limit forest production to the same extent that they do field crop production.

With its rolling terrain and numerous lakes this is a picturesque country, provided that the forest cover is not destroyed. It has become noted for its recreational attractions. Tied in closely with both forestry and tourism is the management of game, fur and fish. The tourist, hunting, trapping and fishing industries vie with forestry as the dominant land use in this area. There are at least 2,300,000 acres too

rocky or too wet to produce timber of high quality but suitable for these other industries.

5. The Temiskaming Clay Belt

The greater part of this region is an undulating plain of clay and silt laid down in the waters of a glacial lake whose despoits cover in large part an "outlier" of Paleozoic limestone bedrock which occurs in that region. On the periphery of the region, the topography becomes rolling and the clay and silt is found only in the valleys between outcroppings of Precambrian rocks.

The climate, though not as favourable as in Southern Ontario, is similar to the better pockets of the Algonquin-North Huron Shore region just described. In the southern part around New Liskeard it has the favourable pattern of local climates which is found in broad undulating plains. In the north and in the valleys between Precambrian rocks frost hazard is more common.

Though the silts and clays form excellent parent materials, having a good reserve of plant nutrients, tillage and fertility are fairly difficult to establish in virgin soils because of the accumulation of peat and underlying heavy clay layer. On the well drained areas the soils are more leached and consequently the surface soils are lower in nutrients and must be built up before the reserves of plant food in the parent material can be fully utilized.

Of a total of 900,000 acres in this region there are approximately 540,000 which are fair to good for field crops with a significant portion so broken by bedrock and swamps that communities based on agriculture alone are not feasible.

6. The Cochrane Clay Belt

The great clay belt in the District of Cochrane extends from Ramore northwest through Cochrane and Kapuskasing to some 50 miles west of Hearst, and extending on each side of the C.N.R. line for distances varying from 10 to 50 miles, comprising a total area of approximately 14,000,000 acres.

18-36 inches poorly decomposed organic matter, low in plant nutrients, difficult to drain

6-16 inches blue grey plastic clay, high in mineral nutrients which require good tillage before available for crop growth



A typical profile of the imperfectly drained soils of the northern clay belts, which comprise up to seventy per cent of the soils of these areas. Better drained soils are widely distributed in narrow strips throughout the clay belts. This deep layer of peat must be incorporated with the mineral rich clay before it is suitable for agricultural production

This is largely a gently undulating clay plain. At intervals of two to seven miles there are long trains of sand and gravel which underlie the clay, often at shallow depths, and which may appear at the surface in local areas. These permeable materials underneath the clay provide better-than-average drainage. Though the surface soils of the better drained areas are leached and lower in fertility, the facilities which good drainage promotes in making plant food available make these more desirable soils than the poorly drained areas, where (though they look rich on account of the high organic matter), waterlogging prevents the breakdown of the organic matter and the mixing of organic and mineral materials, an essential characteristic of good soil.

The cool moist climate of Northern Ontario is responsible for a type of soil which limits agricultural development. The better-drained clays under natural conditions are highly leached, so that the virgin soils have a surface layer of low fertility. The more poorly drained clay soils are covered with one-half to five feet of partially decomposed mossy or woody material (peat) which is low in plant nutrients. The peaty layer acts as a sponge and seriously hinders any effort to improve drainage. It also tends to increase the frost hazard. Underlying the peat is a very compact clay layer, the amelioration of which presents a problem even greater than that of draining and removing the peat. The clay and loam parent materials are generally rich in lime and plant nutrients, but these reserves can only be drawn upon through building up a good surface soil. This requires the application of mineral and organic fertilizers and years of good management before full production is possible.

Climate directly affects the agricultural production through the shortness and variability of the frost-free period, comparatively long winters and, in many areas continued wet weather during the harvest period. The initial infertility of the soil already mentioned is an indirect result of the climate.

The cool moist climate of the north favours the development of a forest of conifers and other plants whose litter tends to be acid and resistant to decomposition.

One million out of a total of 14,000,000 acres is reasonably well drained. Furthermore, with the exception of a few broad areas, such as in Glackmeyer township near Cochrane and at Moonbeam, the well drained land occurs in narrow strips along stream courses, on ridges, swells or flats underlain by sand and gravel. There is another 4,000,000 acres somewhat more difficult to develop, largely because of drainage. This 4,000,000, together with the 1,000,000 acres of well drained soils, give the greatest promise of successful development. It must be remembered that since these 5,000,000 acres are scattered throughout the whole clay belt their development is tied up with that of their poorly drained associates.

The northern clays are among the world's best producers of black spruce. While the rate of growth of spruce is slow where there is more than one foot of peat over the clay, the quality is unsurpassed.

7. Lakehead Ridges and Pockets

The Lakehead Region, with the exception of an undulating plain of sand, silt and clay in the immediate vicinity of the Lakehead cities, is a country of high ridges with clays and silts in the valleys. Compared with Southern Ontario the climatic hazard for the region is moderately high. Frosty local climates are common in the narrow valleys and on the shallow clay uplands.

The natural soil characteristics are good to fair, compared with the best in Ontario. The organic matter decomposes with moderate rapidity and mixes fairly easily with the mineral soil on the well drained locations.

Of the total 800,000 acres in this region slightly less than half is fair to good agricultural land and another 100,000 acres is fair to poor. Although there are some areas of uniformly good land, most of the region is so broken that

an integration of agriculture with forestry, tourism and wildlife management is essential. It is a region well adapted to tourism and other recreational activities.

8. Rainy River Clay Plain

The Rainy River Clay Plain is an area of approximately 700,000 acres which is part of the Agassiz Plain of Manitoba. For the most part it is gently undulating, being flatter near the Rainy River where it is occasionally dissected by stream courses, and more rolling to the north where the clay deposit becomes thinner and rock-knobs begin to outcrop. There are several large muskegs which, because of their size and regular form, do not seriously break up the better agricultural area. Low gravelly ridges with associated seepage spots paralleling the Rainy River are the chief breaks in this block of 500,000 acres of good arable land.

The climatic hazard is moderate since the regions of high climatic hazard swing to the north as they pass from Old Ontario to North-western Ontario, as appears on the accompanying map of Agricultural Use Capability.

The natural soil characteristics are good. Though most of the well drained areas have the leached surface soil which is found under coniferous forests, there are some areas, particularly near the Rainy River and Lake of the Woods, where a rich subsoil suggests this area was once prairie.

9. Dryden Clay Plain

The Dryden Clay Plain is a local area in the North-western Rocky Uplands where is found a layer of heavy clay usually thick enough to cover the underlying rock, but not thick enough to smooth all the irregularities of its rolling topography. It is a plain greatly broken by rock outcropping, sand ridges and swamps. A soil survey indicates approximately 200,000 acres with a fair to good agricultural potential in this area. The climatic hazards are moderately high, resulting in soil characteristics somewhat similar to that of the Cochrane Clay Belt.

10. North Western Uplands

This is a rocky upland region broken by innumerable lakes and rivers. The drift over bedrock is in general somewhat deeper than in other rocky upland areas in Ontario and the parent material commonly has a moderate lime content. There are areas of deeper silt and clay which are suitable for agriculture but these are generally of small extent and broken by rock ridges and swamps. Examples of such areas which have been developed are Nakina and Upsala. The Dryden Region already described is actually a larger clay pocket which has been separated out from this Region.

11. Superior-Huron Uplands

The Superior-Huron Uplands is a region of rolling rock-knobs and sandy or peaty depressions. Occasional ridges and outwash plains of acid sand and gravel are found throughout the upland areas. Toward the south along the Superior shore and along the boundary of the North Huron Shore Region are gravel beaches and deltas of an early glacial lake.

Most of the soils in this region are too coarse or too shallow for economic agricultural development. About 12 per cent are too shallow or too wet to produce merchantable trees.

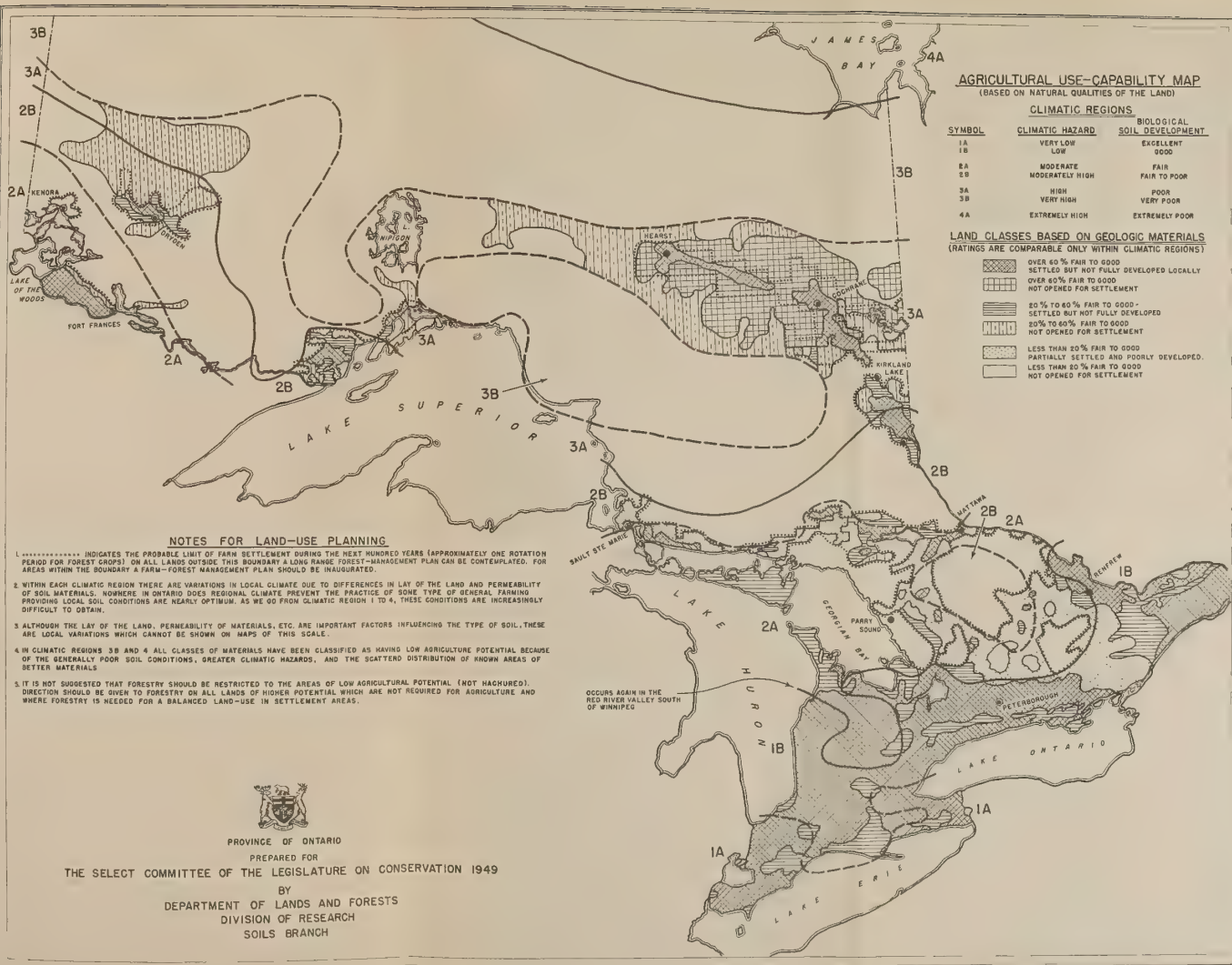
12. Northern Coastal Plain and Upland

Bogs are characteristic of this region. In the coastal plain the land is very level, the average slope being less than two feet per mile. Most of this plain is a floating bog or series of floating bogs with only a fringe (ranging from a few rods to a quarter of a mile) along the stream courses well enough drained to support a growth of merchantable trees. The main exceptions are the sandy ridges (old sea beaches) which parallel the coast. Lying to the south of this very level plain is a hallow rocky upland area so smooth that it too is covered with bogs, some of which are floating but most are "muskegs" of sphagnum peat. Low ridges supporting poor stands of black spruce are common though seldom occupy-

ing more than a third of the total area.

The climatic hazards of this region are high to very high although not so high as to prevent the growth of agricultural crops providing there were sizable areas of well drained soils. Such soil conditions are rare being found in local areas along the larger streams such as Moose Island and comprising less than 1/100 of one per cent of the total area.

The chief production of this area is fur. Much of the area is now within a management unit for beaver.



CHAPTER 5

HISTORY OF SETTLEMENT

Clearing and settlement of most of the agricultural lands of Ontario have taken place within the past 150 years, although there are reports of settlement as early as 1700 in the extreme southwest. The records of the Agricultural Commission in 1881 indicate that clearing the land was still one of the major problems at that time. Even Essex County was, for instance, about two-thirds in bush as late as 70 years ago.

Most of the settlers came from the British Isles and European countries where the land was overpopulated. For many of them a lifetime of work had promised only a bare existence. Here they found what appeared to be unlimited land, obtainable almost for the clearing. The ownership of land promised security and it seemed to them all that stood in the way of a prosperous life was the forest, which they had to get rid of before crops could be grown.

As the trees were cut off, crops were produced and livestock grazed on the clearings. Fences were required to confine the livestock and straight-sided fields were considered essential for the advantageous use of machinery which was coming into use. Consequently, as a rule, Ontario farming developed on the pattern of a central lane bordered by square or rectangular fields leading from the buildings to the back of the farm. The topography of the farm influenced this general plan very little. Cultivation with the fences rather than with regard to the slope or topography of the land accordingly became the accepted practice and has largely remained so. Thereafter all the land in a field was cropped similarly regardless of soil types, steepness of slopes or crop adaptability.

Under forest cover the land had been protected against beating rains, extreme temperatures, and the direct



Many acres of productive land are overgrown with hawthorn and weed trees as a result of poor pasture management



Poor land makes poor people. Land unsuited to agriculture produces sparse pasture, weeds and a derelict house. Land use planning can prevent "rural slums".

action of high winds. Protected and nourished as the land then was, soil organisms kept it in excellent physical condition. The nature and amount of this organic matter depended on the species of trees in the forest and the climate. The kind of forest trees in turn was determined by the depth, mineral composition and topography of the land as well as to a less noticeable extent by variations in climate. The magnificent hardwood forests of Southern Ontario left a topsoil generally suitable for agricultural production, quite different from the heavy peat deposited by the spruce forests further north.

Only a few shade-loving native grasses grew under the heavy forests of Southern Ontario. Fortunately a few settlers brought in foreign grasses, such as timothy, which flourished and spread over our lands as tree cover disappeared. Without them it is probable that topsoil would have disintegrated very rapidly. The steady increase in livestock encouraged the growing of hay, for which we should be thankful. Few people realize how much they owe to the humble but vigorous grasses which can be seen along our highways and roadsides.

In general, too many trees were cut off. Some of the pioneers regarded the tree as an enemy. After years of arduous toil with the axe they could hardly do otherwise. On the best lands no ill effects were noticed. However, in some areas a few years of good crops were followed by declining production. There the population was much greater 80 years ago than it is today. From these areas thousands of the second generation moved on to seek better land in the West.

After the trees had been cleared the imported grasses grew luxuriantly because the soil contained abundant minerals and was naturally in good physical condition. As farming progressed, it was realized that cropping took certain values out of the soil. It became common to apply salt and land plaster. About 60 years ago superphosphate

arrived as the commercial material to supplement fertility. No methods were available at that time to determine what lands would respond to supplemental fertilizer. However, since that time, through soil surveys, field investigations and a clearer understanding of both the chemical and physical properties of soils, a fuller and more complete picture of the requirements for the growth of crops throughout the Province is evolving.

Concepts of soils vary with individuals and with nations. The attitude toward the soil is formed in accordance with the use for which it is being considered. Familiarity with the nature of soils and appreciation of the problems involved in their use may modify opinions formerly accepted. Citizens of Ontario will do well to look at soils as basic to our way of living. Soil is not just the material on which we build buildings, it is the stuff of which empires are made. No nation can prosper if its basic agriculture is declining. Soil is the basis of agriculture; soil is the basis of life.

We borrow from the soil whatever is essential for our life today and when our life is ended we repay our debt to the soil and become dust. There is one discrepancy. That part of the soil which is wasted by erosion, sewage disposal, indifference, and carelessness is lost forever to future generations. The future belongs to those who conserve the soil.

Would it not be better to think of our Province as being so many inches deep rather than so many square miles in area? Once the depth of the topsoil is gone the agriculture of Ontario would be reduced as effectively as if most of the Province were to sink below the ocean.

The soil belongs to all living things. It is not imperishable or permanent. The farmer attends the soil but what he does with it depends on the social and economic pressure which is brought to bear on him. Hence people in all walks of life are involved. Soil is a part of Nature's environment and Nature will not be treated selfishly without retaliation.

The chief product of the soil is Man himself. From the soil come the quality of bone and muscle and his state of health. Indeed, Man is what he is because of where he is in relation to the Soil. His energy, his ability to think, and his very disposition come from the Soil on which he walks just as truly as the grain and corn which grow there.

Soil, as we see it, is our heritage from the dead and our dowry to countless numbers yet unborn; it represents the future at our feet.

CHAPTER 6

SOIL SURVEYS

If there were mistakes made in the settlement of early Ontario, the pioneers can hardly be criticized. They lacked the scientific weapons which are at our command today. The first essential of soil conservation is to know more about the soil. The first and highly important step is the soil survey.

Soil surveys include those researches necessary:

- (a) To determine the characteristics of soils.
- (b) To classify them into defined units or types.
- (c) To establish and to plot their boundaries on maps.
- (d) To predict their adaptability to various crops, grasses and trees, their behaviour under different management practices, and the yields of adapted plants under specific management systems.

As agriculture developed, the need for a soil survey to classify and list systematically the nature of soil in every area of the Province became more and more apparent. Information was needed as a guide in choosing certain soils for special crops. It was not by chance that Norfolk County was the first for which a Soil map was made in 1932. Here was a county in which large tracts of land were not in use for profitable production. The climate was suitable for the production of flue-cured tobacco and some of the soil proved satisfactory. Farmers used the map extensively as the flue-cured tobacco industry developed.

Soil survey information serves an equally useful, if less spectacular purpose, in connection with all other phases of land use. Indeed an inventory of the soil is of prime importance in dealing with any program in which the use, development or maintenance of the land is involved.

Since 1935 soil surveys in Ontario have been conducted jointly by the Ontario Agricultural College and the Dominion Experimental Farm Service. The accompanying maps show the status of Soil Surveys by Counties and Districts in Ontario.

To date 29 counties have been surveyed and mapped, only four of which - Carleton, Prince Edward, Durham and Essex - have a published report. In Northern Ontario some broad reconnaissance mapping has been done in the agricultural parts of five districts, one of which is complete with map and report. The interpretation of a soil survey by the man on the land is dependent to a large degree on these published reports, which are recognized as being of a very high standard. There is a definite need for these published reports to be made available for the remaining counties and the agricultural areas of Northern Ontario.

The Dominion-Provincial surveys have been under way for a good many years. We can take satisfaction in the high standard of the work, but this Committee believes it must now be accelerated, so that it can be completed in the near future. Required of course are more trained men for the Dominion-Provincial survey teams and more funds. This Committee attaches great importance to the matter and strongly recommends that:

A DETERMINED EFFORT SHOULD BE MADE BY THE PROVINCE, IN CONTINUED CO-OPERATION WITH THE DOMINION, TO ACCELERATE THE SOIL SURVEYS BY COUNTIES WHICH HAVE BEEN UNDER WAY FOR SOME YEARS PAST, SO THAT THEY MAY BE COMPLETED AND BOTH MAPS AND REPORTS PUBLISHED IN THE NEAR FUTURE.

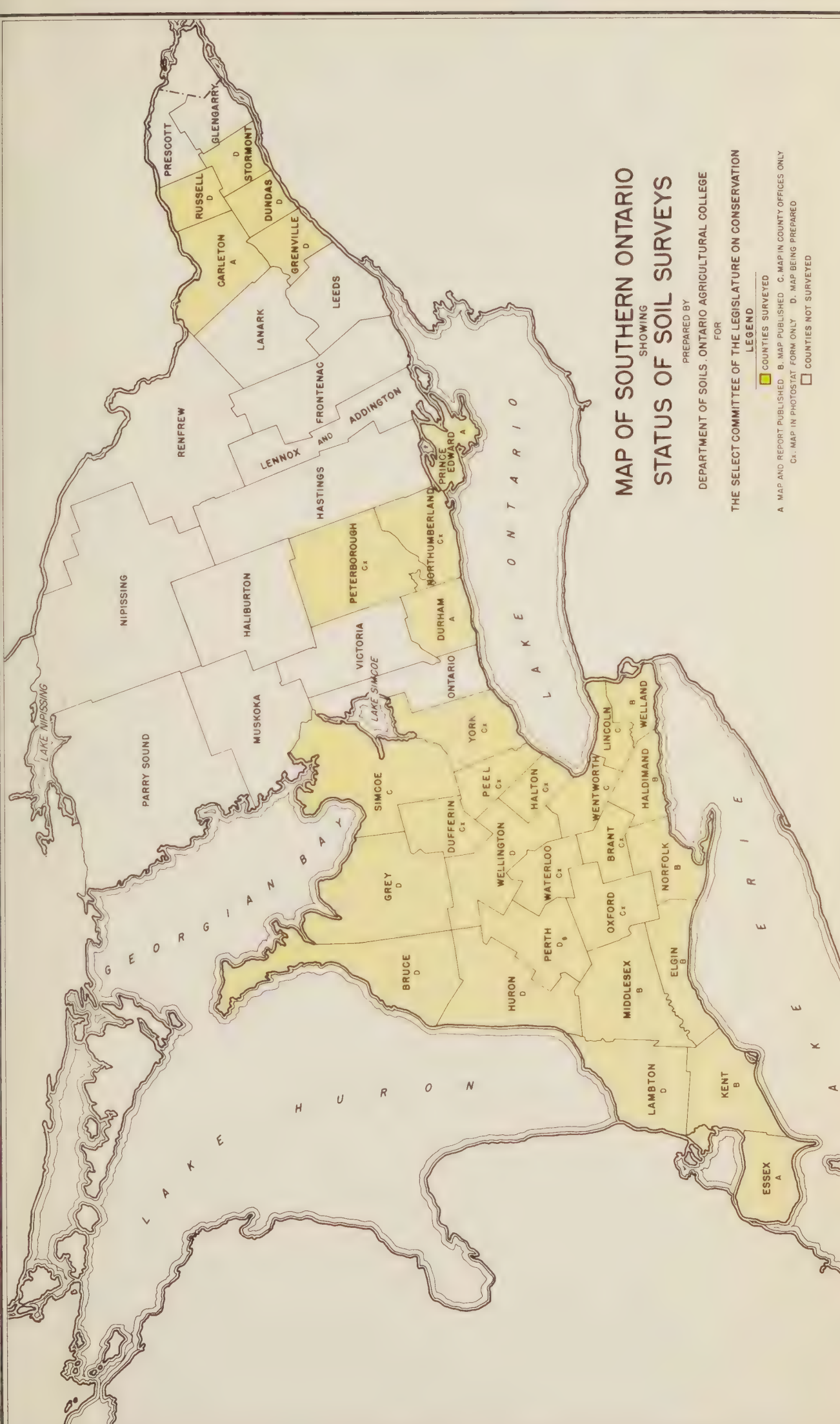
There are other agencies or departments of the Ontario Government engaged in making geographic studies of soil types and the classification of land. The Research Division of the Department of Lands and Forests is conducting soil surveys in the Territorial Districts to determine:

- (a) A separation of agricultural and forest lands.
- (b) A rating of forest land according to productivity.
- (c) The soil and nutrient requirements of tree species.

The Department of Planning and Development is conducting soil conservation studies as an integral part of water-

shed conservation surveys. An appraisal is made of the present land use, the incidence of erosion or susceptibility to erosion, economic factors effecting land use, and the capabilities of the soil. An adjustment of these factors provides the basis of a recommended land use program.

A reconnaissance survey of the physiography and soils of Southern Ontario, excluding the area in the Precambrian Shield, was initiated in 1935 by the Ontario Research Foundation, under the direction of L. J. Chapman and D. F. Putnam, and has recently been completed. Summaries of these studies have been published and a complete report of this entire work, entitled "The Physiography of Southern Ontario" will be published this year, 1950.







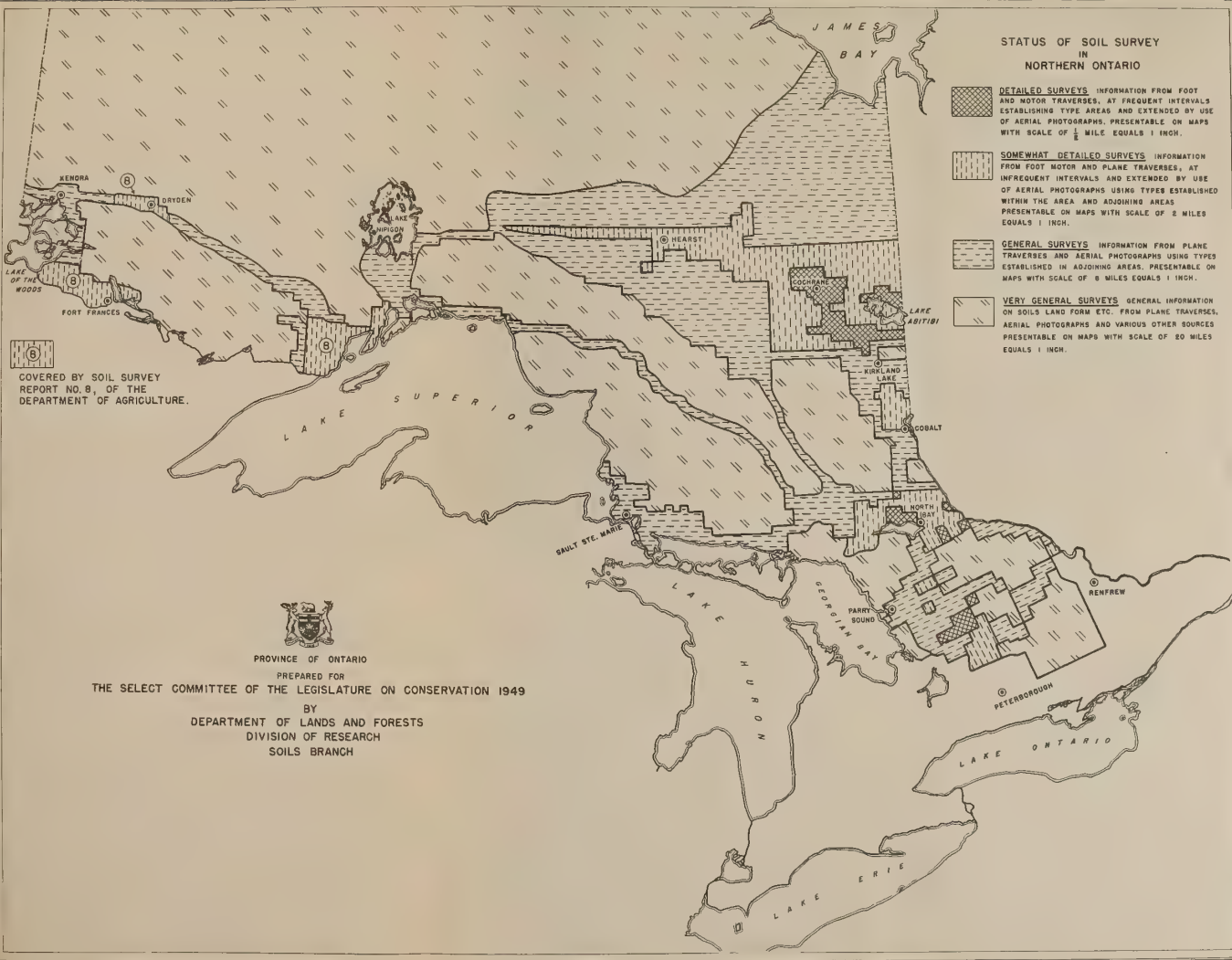
MAP OF SOUTHERN ONTARIO SHOWING STATUS OF SOIL SURVEYS

PREPARED BY
DEPARTMENT OF SOILS, ONTARIO AGRICULTURAL COLLEGE
FOR
THE SELECT COMMITTEE OF THE LEGISLATURE ON CONSERVATION

- LEGEND
- COUNTIES SURVEYED
 - MAP AND REPORT PUBLISHED
 - MAP IN COUNTY OFFICES ONLY
 - MAP IN PHOTOSTAT FORM ONLY
 - MAP BEING PREPARED
 - COUNTIES NOT SURVEYED

STATUS OF SOIL SURVEY
IN
NORTHERN ONTARIO

-  **DETAILED SURVEYS** INFORMATION FROM FOOT AND MOTOR TRAVERSES, AT FREQUENT INTERVALS ESTABLISHING TYPE AREAS AND EXTENDED BY USE OF AERIAL PHOTOGRAPHS, PRESENTABLE ON MAPS WITH SCALE OF $\frac{1}{2}$ MILE EQUALS 1 INCH.
-  **SOMEWHAT DETAILED SURVEYS** INFORMATION FROM FOOT MOTOR AND PLANE TRAVERSES, AT INFREQUENT INTERVALS AND EXTENDED BY USE OF AERIAL PHOTOGRAPHS USING TYPES ESTABLISHED WITHIN THE AREA AND ADJOINING AREAS PRESENTABLE ON MAPS WITH SCALE OF 2 MILES EQUALS 1 INCH.
-  **GENERAL SURVEYS** INFORMATION FROM PLANE TRAVERSES AND AERIAL PHOTOGRAPHS USING TYPES ESTABLISHED IN ADJOINING AREAS, PRESENTABLE ON MAPS WITH SCALE OF 6 MILES EQUALS 1 INCH.
-  **VERY GENERAL SURVEYS** GENERAL INFORMATION ON SOILS LAND FORM, ETC. FROM PLANE TRAVERSES, AERIAL PHOTOGRAPHS AND VARIOUS OTHER SOURCES PRESENTABLE ON MAPS WITH SCALE OF 80 MILES EQUALS 1 INCH.



COVERED BY SOIL SURVEY
REPORT NO. 8, OF THE
DEPARTMENT OF AGRICULTURE.



PROVINCE OF ONTARIO
PREPARED FOR
THE SELECT COMMITTEE OF THE LEGISLATURE ON CONSERVATION 1949
BY
DEPARTMENT OF LANDS AND FORESTS
DIVISION OF RESEARCH
SOILS BRANCH

CHAPTER 7

ORGANIC MATTER

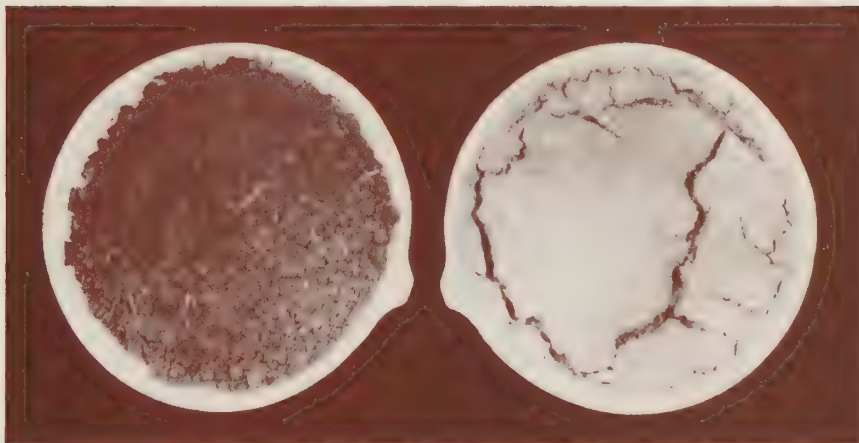
Soil organic matter, popularly called "humus", is composed of plant and animal matter undergoing decay. It is derived from such material as dead roots, leaves, fruits and stems of plants; the carcasses of animals, worms and insects; live and dead soil micro-organisms, and various products from the decomposition of dead residues.

Chemically, organic matter consists of proteins, carbohydrates, fats, resins, waxes and similar compounds. Humus represents an advanced stage in the decomposition of organic matter.

It is important to note that organic matter tends to bind loose soils, to open up the heavier soils and to increase the water-holding capacity of all soils. It provides a home and food supply for soil micro-organisms, including the nitrifying organisms, such as the organisms which make nitrogen available as a plant nutrient. In the process of decomposing, organic matter not only liberates nutrients to feed plants but also reduces losses by leaching of these nutrients. Another valuable service is that organic matter retards the loss of topsoil by erosion.

For these reasons, organic matter or humus is often referred to as the "life of the soil". All living things supported by the soil return to it in the end. There they are broken down by living microscopic organisms that swarm in the soil - "micro-organisms". In getting food for themselves these micro-organisms break down raw organic matter, such as stubble or leaves, into this complex substance called humus, and this again into simpler elements. In their turn the micro-organisms themselves die by the billion and add to soil organic matter. The processes of life, not all visible to the naked eye, are furiously active in every cubic foot of soil: birth, growth, death and decomposition. There is more drama in the

ORGANIC MATTER IS THE KEY TO GOOD SOIL STRUCTURE



This well granulated humus rich soil absorbs water readily, drains freely, yet holds moisture for the crop when it needs it.

When rain hits this soil, exhausted of organic matter, it runs off quickly and soon sets like concrete.



The practice of green manuring provides an abundant source of soil organic matter

soil than appears at a glance from the highway.

Organic matter is associated with high productive capacity, serves as a store-house for available nutrients required by crops and thus contributes directly to soil fertility.. It is the main source of nitrogen, which it yields up as it is destroyed, and it shapes the physical properties of soils by regulating the supplies of air and water.

Organic matter is declining in many of the farm lands of Ontario, probably in most of them.

On the other hand, there are farms (where crop yields are noticeably high) on which, through changes in systems of soil and crop management, productive capacity has been remarkably increased. Although these are probably the exception, they do suggest encouraging possibilities for general improvement.

In general, sods, including both hay and pasture, particularly those including the legumes which bring nitrogen from the atmosphere, are the most useful for restoring organic matter to the soil. The extent of their usefulness for this purpose depends of course on how closely they are cropped and how well the supply of mineral elements required for growth is maintained, as well as the kind of plants which make up the sod. Cultivated crops, especially when grown continuously, lead to a relatively rapid decline in the content of organic matter in the soil.

What may be expected in the organic matter content of soils due to different cropping treatment is shown by analyses of soil samples taken on dairy farms in Waterloo County. The samples from each farm contained a set of three, from a similar type of soil, taken under the conditions noted in the following table:

AVERAGE PER CENT BY WEIGHT OF ORGANIC MATTER IN SOILS
FROM 112 FARMS IN WATERLOO COUNTY IN 1947

<u>Kind of Soil</u>	<u>Soil Management</u>		
	<u>Cultivated Fields</u>	<u>Meadows & Pastures</u>	<u>Grass Fence Rows</u>
	Per Cent	Per Cent	Per Cent
Clay and Clay Loams	2.8	2.8	4.4
Loams	2.8	3.1	4.3
Sandy Loams	2.3	2.3	3.6

These data indicate that under fence-row conditions, where land is not cultivated and most of the growth must be left to rot down, the organic matter content is considerably higher than in fields that are cropped or cultivated. Under heavy pasturing, the organic matter in soils under sod is no higher than that in cultivated fields.

The decline of organic matter in the soil is normally reflected in the appearance and yield of crops. Such a decline being associated with deterioration in soil structure and hence lowered ability to absorb and transmit water, leads to increased run-off of both water and soil. Lowering of the organic matter also renders soils more subject to damage by wind and fertility losses through leaching.

The main factors responsible for the deterioration of the structure of soils are the depletion of organic matter, the mechanical action of rain striking exposed soil and the scouring effects of tillage implements during cultivation.

Throughout most of Ontario there is a lack of appreciation for the value of mature crop residues and waste wood products, such as sawdust, for replenishing organic matter in the soil. When these products are burned the stored energy in them is lost. These materials are low in nitrogen and when applied in appreciable amounts their decomposition may result in a shortage of available nitrogen for growing crops unless

enough is provided to meet the requirements of the soil organisms and the growing crop as well. This has led to the erroneous belief that such materials are harmful to the land. They are in fact valuable sources of organic matter owing to their ability to resist rapid and complete decomposition. They are being successfully utilized on many farms mainly through bedding and litter where they become part of the barnyard manure but also by their direct application to the land along with a source of nitrogen.

There is an abundance of nitrogen in the atmosphere - indeed, it is alleged that the air over one acre of land contains \$5,000,000 worth. To obtain this valuable nutrient from commercial sources the farmer must pay a high price. Nature has its own process for extracting it from the air and getting it into the soil. This is the service performed by alfalfa, sweet clover and other legumes. When these crops are grown and ploughed under they not only contribute all-important nitrogen but also add tons of organic matter to the soil. The very fact that the additional organic matter is there makes more of the nitrogen available as a plant nutrient for subsequent crops.

Until recently the place of grasses and legumes in sound farm practice and in conservation farming was scarcely realized and it is not even yet appreciated as it should be. Only during the past few years have farmers generally become conscious of the advantages to be gained from the proper utilization of improved pasture and hay mixtures. Now in Ontario many counties have annual grassland Field Days and much propaganda has been directed toward improved hay and pasture mixtures. During the past ten years the Ontario Agricultural College, the Kemptville School and the Ridgetown School, by experimentation and demonstration, have focused sharp attention on what may be accomplished by the use of good grass mixtures plus sound grassland management, crop adaptability and proper rotations.

Evidence brought before this Committee proved that the Ontario Crop Improvement Association through its provincial organization and county associations was providing very strong and effective leadership in both soil and crop improvement. All over the Province this Committee found strong, aggressive and constructive leadership by this Organization in its particular field of operation. It is sufficiently well organized to be successful in its high purposes, both provincially and on a community basis. This Committee recognizes the importance and effectiveness of local leadership by farm organizations at the county level, and we therefore recommend that:

GOVERNMENT GRANTS TO COUNTY CROP IMPROVEMENT ASSOCIATIONS SHOULD BE INCREASED SO THAT THEY MAY UNDERTAKE AN EXTENDED PROGRAM OF LOCAL DEMONSTRATIONS TO SHOW THE IMPORTANCE OF GRASS-LAND IMPROVEMENT IN ONTARIO, EMPHASISING THE VALUE OF PERMANENT AND SEMI-PERMANENT SEEDING OF GRASS AND LEGUMES ON SLOPING AND MARGINAL LANDS AND THEIR KEY ROLE IN THE CONSERVATION PROGRAM.



Improved pasture management is a prerequisite of efficient land use.

CHAPTER 8
SOIL EROSION

Until recently in Ontario comparatively little attention has been paid to soil erosion. Too often it was considered that certain established practices were fundamentally sound, without considering the effect of such practices on the erodibility of the soil. Only in recent years have farmers become conscious of the fact that sheet and wind erosion were serious problems, even on fertile, heavy soils.

The past winter season of 1949-50 has perhaps done more to dramatize the problem of soil erosion than any other single thing. We in Ontario have been under the impression that our normal winter season is an asset in protecting our soils from erosion. However, the current season has clearly demonstrated what can happen to soils when they are not frozen into immobility and covered with a mantle of snow.

Due to our location and normal climatic conditions we have assumed that erosion on our heavier soils in particular was of minor importance. It must now be realized that we have erosion too, and that keeping the land covered, increasing its ability to absorb precipitation and thus reduce run-off is of paramount importance.

According to W. J. Stallings, Principal Soil Conservationist of the United States Department of Agriculture:

"The falling raindrops blast the soil particles apart at the point of impact, and surface flow tears the soil particles from their moorings by the scouring process. More than 100 tons of soil per acre may be splashed by the most beating types of rain falling on a bare, highly detachable soil. Soil not splashed or torn loose by the falling raindrop is not likely to undergo any serious erosion".

Another United States scientist who has been doing research on this subject for a dozen years finds that "the mighty raindrop" does not stay where it falls:

"It strikes the surface of the earth, and then bounces back into the air. When it hits it tears soil particles loose and carries them into the air

in suspension. We've always thought soil erosion and soil loss were the same. This isn't true, for soil erosion is a process consisting of detachment and transportation of soil particles. Erosion can be injurious without actually carrying soil off a field".

The damage is done of course on bare unprotected soil. Here "splash erosion" is at its worst, each drop acting like a miniscule bomb. A one-inch rain can move 100 tons of soil per acre. This is one of many reasons why cover crops, mulching and manuring are so important to the maintenance of soil structure and the absorption of moisture without damage. The best of all protection is a blanket vegetation, which breaks the impact of the rain and lets it dribble gently into the soil. Unfortunately, vegetation on many Ontario farms has been too thin.

A soil erosion and land use survey of 22,000 acres in Durham County made by the Ontario Agricultural College and the Central Experimental Farms made clear that erosion is not an academic question but a real problem in Ontario :

27	per cent of the area is slightly eroded
24	" " " " " " moderately eroded
6	" " " " " " severely eroded
6.5	" " " " " " very severely eroded

On the present crop land of that area, 35 per cent was moderately eroded and 6 per cent severely or very severely damaged.

Investigations of soil erosion by water at the Central Experimental Farm, Ottawa, have included the influence of precipitation, slope, use of farm manure, cover, contour and strip cropping, on soil and water losses from a clay soil.

These studies showed that the distribution and intensity of individual rainstorms is a much more important factor than the total rainfall. During the growing season of 1947, a loss of 28.7 tons of soil per acre occurred on a corn plot on a 10 per cent slope, while during the similar period of 1948, the loss from the same plot was only 2.3 tons per acre despite

¹Richards and Morwick: "Soil Erosion and Land Use Survey, Hope Township Project Area, Durham County".

almost identical total rainfall.

The greater the degree of slope, the faster is the flow of water, with the result that greater erosion occurs. In four years the total loss of soil from corn on the 10 per cent slope was 124.5 tons per acre, as compared with 61.9 tons per acre on the 5 per cent slope.

The application of barnyard manure reduced erosion by improving the physical condition of the soil and increasing water absorption.

The influence of plant covering on soil and water losses from a 10 per cent slope is illustrated by the results in the following table:

LOSSES OF SOIL AND WATER UNDER DIFFERENT CROPS WITH
TILLAGE UP-AND-DOWN THE SLOPE
FOUR-YEAR AVERAGE (1945-1948)

Crop	Soil Losses Tons Per Acre	Water Losses Tons Per Acre
Summer Fallow	31.9	228
Corn	31.1	289
Oats	0.9	58
Alfalfa	0.1	28

Alfalfa protected the soil throughout the season with the result that soil losses were negligible.

The value of cultivation across rather than up and down the slope in reducing losses on corn is shown in the following table:

COMPARISON OF ANNUAL RUN-OFF LOSSES IN TONS PER ACRE ON A
10 PER CENT SLOPE FROM CORN WITH TILLAGE AND SEEDING ON
THE CONTOUR AND UP-AND-DOWN THE SLOPE

Period	Contour		Up-And-Down Slope	
	Soil	Water	Soil	Water
Average 1945-1948	8.6	117.8	14.6	169.0



The land is wounded when its vulnerable natural watercourses are not protected the year around

A well kept grassed waterway prevents gullying

(Courtesy Woodstock Sentinel Review)



Results of run-off studies carried out in Waterloo County indicate the same general effect of covering and direction of slope there as are shown in the Ottawa data.

Some interesting information has been obtained at the Central Experimental Farm on the effects of removal of the surface soil on crop yields. These are presented here since they reflect what may be expected on eroded soils.

THE EFFECT OF REMOVING SURFACE SOIL ON CROP YIELDS

Soil Treatment	Barley	Alfalfa
	Bus. Per Acre 7-year Average	Tons Per Acre 3-year Average
Normal depth of surface soil	33.2	2.79
3" of surface soil removed	26.6	2.39
All but 1" of surface soil removed	14.8	1.94
All of surface soil removed	4.0	1.44

Information gathered during soil surveys shows that on many sloping and rolling fields that are being cropped, there are areas varying up to one acre in size where erosion has accounted for partial to complete removal of the topsoil. Such damage makes serious inroads into the profits from cultivating those fields.

Long slopes present a greater erosion hazard than short slopes, owing to the increased velocity and accumulation of water. Such special treatments as strip cropping, contour stripping and diversion channels should be adopted where required to cope with such conditions. In general, the most effective means of controlling erosion appears to be by keeping sloping and rolling land well covered with sod crops. In many instances, this objective was approached by growing the cultivated crops on the level land and keeping the remainder in hay and pasture. By growing adapted legumes and grasses and maintaining adequate fertility, sufficiently good physical

condition of the soil may be maintained to reduce the subsequent erosion hazard during those periods the land is under cultivation.

There is much steep unproductive land in pasture and cultivated crops at present in Ontario on which erosion is prevalent. Some of this land is obviously not well suited for agricultural crops since erosion control on it is virtually impossible. On many farms throughout the Province practically all of the land is either sloping or rolling. Complex slopes and rolling land present more difficult problems in erosion control than simple slopes.

Much research and experimental work has yet to be done in order to establish the basic principles involved in the prevention of soil erosion in the Province of Ontario. This Committee therefore recommends that:

RESEARCH AND EXTENSION WORK SHOULD BE UNDERTAKEN
ON THE FOLLOWING QUESTIONS:

- (1) THE INTENSITY AND FREQUENCY OF RAIN IN VARIOUS AREAS OF ONTARIO, AND THE RELATIVE ABILITY OF DIFFERING SOIL TYPES TO ABSORB WATER.
- (2) THE USE OF FALL AND WINTER COVER CROPS.
- (3) THE EFFECTIVENESS OF FALL VERSUS SPRING PLOWING.
- (4) THE WIDTH OF CROP STRIPS IN RELATION TO THE CONTROL OF BOTH WATER AND WIND EROSION.

CHAPTER 9

SOIL DEPLETION OR LOSS OF FERTILITY

There is a great variation in soil types and in their agricultural potential when they first come under cultivation - in other words some are much better than others at the very outset.

Having conceded this variation, there emerges an equally significant fact which seems to be true of all the agricultural soil types: as the years go by their productivity is variable - that is, some get better, some get worse, and some remain about the same.

This is what has been happening in Ontario. Some farms are becoming more fertile, some are just holding their own, while others suffer from soil depletion and are definitely less fertile.

In a sense soil depletion occurs on practically all lands subject to cropping. This is not significant, however, if values are returned to the soil, either by natural processes or by the spreading of manure or commercial fertilizer.

The sale of farm products accounts for the greatest single loss of soil fertility from farm lands. A wheat crop of 40 bushels per acre contains about 47 pounds of nitrogen, 21 pounds of phosphorous and 12 pounds of potash. If the wheat is sold these values leave the soil and leave the farm. Losses with other grain crops are somewhat similar.

When farm crops are fed to livestock and marketed indirectly through the sale of livestock products, the drain on soil fertility is relatively much less.

The average annual removal of fertility per acre of pasture in Ontario where milk is the product sold, amounts to about 4 pounds of nitrogen, 6 pounds of phosphorous and 1 pound of potash. Losses where the product is meat are also relatively low. These examples serve to illustrate that cash cropping accounts for a much higher loss of soil fertility than livestock farming.



Soil losses on slopes such as these often amount to over thirty tons per acre per year. The damage is twofold, the slopes have been robbed and the bottom lands smothered

It would be a mistake, however, to suppose that livestock alone will maintain soil fertility. Their manure is not sufficient to compensate for the losses which go away with milk, meat and bone. However, the importance of green manures must not be overlooked. These and other supplements make it relatively easy for the careful livestock farmer to avoid depletion, or indeed to increase the fertility of his soils.

It is not so easy for the cash-crop farmer. He is constantly faced with the threat of depletion, and if he indulges in continuous cropping - without proper rotations - his land is doomed.

In this connection, the Committee's attention was drawn to the active trade in barnyard manure which has grown up in parts of Western Ontario. Certain fruit farmers, tobacco farmers and corn farmers, particularly in counties like Lincoln, Norfolk, Elgin and Kent, are purchasing manure by the ton, usually from truckers who buy it on farms in the livestock area of counties further north. This trade represents a heavy drain in soil fertility from the farm losing the manure. Secondly, it undoubtedly helps the cash-crop farmer to avert or postpone soil depletion, but at considerable cost, transportation being the principal item. This Committee regards the practice as a questionable one and would advise cash-crop farmers to rely, if possible, on rotations, home-grown green manure which could be ploughed under, and of course commercial fertilizer.

The principal ingredients of commercial fertilizer are nitrogen, (N), phosphorus pentoxide or "phosphoric acid" (P_2O_5), and potassium oxide or "potash" (K_2O), which are mixed and sold in proportions designated by numbers, for example, 2-12-10, each number being the percentage of the constituent.

These constituents are also to be found in manure and other plants and animal products. In addition natural fertilizers contain calcium, magnesium and sulphur, sometimes known as secondary elements. Further, they contain lesser

amounts of the so-called minor elements - or "trace elements" - such as cobalt, zinc and boron. The term "trace elements" is used because of the relatively small amounts present - not because they lack essentiality. They may be infinitesimal in volume, but they are essential. The absence of iodine, for example, can have serious effects on animal life, and a deficiency of boron does great harm to turnips.

Shortages of sulphur do not constitute a serious problem in Ontario soils. Sulphur appears in most commercial fertilizer fillers.

Ontario is using about 350,000 tons of commercial fertilizer at a cost of perhaps \$12,000,000 a year. However, it is not used uniformly over 180,000 farms. It is well known that most of it goes into specialty crop areas. For example, about 50,000 tons - or one-seventh of the total - is used by about 3500 farmers growing flue cured tobacco on an acreage of 100,000. The use of fertilizer in many mixed farming areas is not very great.

This is a field in which constant research and improvement are imperative. Annual reports with recommendations are being issued by the Advisory Fertilizer Board, which was constituted in 1934 by an Ontario Order-in-Council and includes representatives of the federal and provincial departments of Agriculture, the Crop Improvement Association and other farm organizations as well as the fertilizer industry.

The trend is towards commercial fertilizer having higher analyses - in other words a higher percentage of fertilizer and a lower percentage of filler, for example 4-24-12 in place of 2-12-6. One difficulty is, however, that under present conditions many of the recommended fertilizers are not obtainable, and farmers must buy a fertilizer of lower analyses "not now recommended" by the Advisory Board in its latest report - January 1950. The shortage is acute but believed to be temporary. Efforts are being made to import potash from European as well as American sources.

The cost of fertilizer and its importance to soils in danger of depletion add emphasis to the need for research in this field, and also the need for the completion of soil surveys and adequate soil analysis service. By these means the haphazard application of a costly product can eventually be avoided.

Some authorities hold that commercial fertilizer gives the best results when applied to soil rich in organic matter, or when applied in conjunction with manure. It seems clear that fertilizer alone will not grow good crops where humus is lacking.

Ontario farmers do not throw manure into the river to get rid of it - as some early settlers on the St. Lawrence are alleged to have done. However, this Committee believes that the loss of fertility through improper or careless handling of manure is still a serious problem. Farmers on the older cultivated soils, in China and many European countries, handle manure like treasure and carefully return it to the land. It should not be allowed to lie idle or be washed away from the barnyard by spring rains. The importance of conserving this source of fertility can hardly be exaggerated.

One other supplement is worthy of mention. Some soils always were (or have become) low in the pH scale - in other words they are too acid. On the other hand certain Ontario soils are high in alkalinity. Acid soils can be brought into balance by the application of agricultural lime, on which the Ontario Government pays a freight subsidy. This remedy is not recommended unless the soil gives an acid reaction on being tested.

Lime not only corrects acidity but supplies calcium and magnesium, and aids in improving soil structure. Despite the subsidy, evidence presented to this Committee indicates that little progress has been made in spreading lime on some of the lands most troubled by acidity. Farmers on such lands cannot expect to prosper unless they invest in lime.

What has been said does not imply that fertilizer, natural or commercial, is the only factor in maintaining soil fertility. Crop rotations, methods of cultivation, the retention of moisture, and other factors discussed elsewhere in this report also contribute to fertility, because they help to keep the crumb-like granular structure of good soil, and enable that soil to make better use of available plant nutrients. Any soil maintained in such condition will favour the growth and activity of the countless micro-organisms, which work at the processes of decomposition and humus-building.

How far has soil depletion affected the agricultural production of Ontario to this date? Exact statistics for yields over the years since settlement are not available; indeed today's figures are only approximations. Moreover there have been so many changes in crop distribution, in plant varieties, in the use of fertilizer and imported feeds and concentrates, and in other variable factors, that it would be difficult if not impossible to compare fertility today on representative soils with fertility a generation or more ago. This Committee is therefore not prepared to state whether productivity over the agricultural areas of the Province as a whole has increased or decreased.

This much, however, is clear: Lands suitable for agricultural purposes, farmed according to the best practices and with due regard for conservation principles, are actually improving in fertility. On the other hand farms which should never have been cleared, and others which could be productive but have been abused or neglected, show all the signs of depletion or exhaustion. Many have already been abandoned and many more are sinking toward inevitable failure.



(Courtesy U.S. Soil Conservation Service)

Belts of soil conserving grass legume crops are alternated with grain and row crops to conserve both soil and water.

CHAPTER 10

SOILS AND NUTRITION

The relation of the soil to the health of animals and human beings is a comparatively new field of study. One of the most intriguing features of the subject is that so little is known about it, although progress has been made in recent years.

Nutrition, in all its aspects, is of course a central field of inquiry in agricultural research. Intensive work has been done on the feeding of livestock, and it is obvious that well-nourished livestock provide better food for human beings.

At the same time, nutrition receives increasing attention from all scientists, physicians and social workers concerned with the health of the human being, physical and mental.

In other chapters of this report the life and health of the soil itself are discussed. This is the field of the soil scientist.

It is becoming apparent that there is a definite chain of relationship between the health of the soil itself, of plant life, of livestock and of the ultimate human consumer. We are only on the threshold of this complex field, which offers a great challenge to scientists of the future. It will be a difficult field of inquiry for it is complicated by many other factors, such as those of climate and genetics.

At this early stage certain obvious generalities can be mentioned. One is that run-down, worn-out soils produce weak crops and support inferior livestock. Human beings who subsist on home-grown food in such areas show the same outward signs of weakness as the crops and the livestock. Another observation is that certain deficiencies in the soil re-appear, for example, phosphorus - deficient soil produces phosphorus-deficient crops, and they in turn produce phosphorus-deficient animals.

Mineral deficiencies are becoming well known to

farmers, who have to choose between replenishing the soil with the needed minerals, or feeding mineral supplements direct to the livestock. In the long run it might be better to restore what is lacking in the soil, but this is a question which can be answered only by exhaustive research.

Incidentally, some authorities think there are times when the rations of livestock and poultry must have mineral supplement, regardless of soil fertility.

At the height of lactation the high-producing dairy cow is often in negative calcium and phosphorus balances. Although the mineral content of her normal rations may be adequate at other times, she is, at the peak of lactation, withdrawing minerals from her skeleton to meet the demands of milk production. This depletion of the skeleton may be made good in the later stages of lactation, provided the normal ration is adequate.

Similarly, the hen may be in negative calcium balance at the height of her egg-production. It may be necessary to supplement her ration at certain times, like that of the high-producing cow, even though soil fertility is excellent and normal rations are of the best quality.

Dietary deficiencies of many kinds undoubtedly have an effect on eyesight and many vital organs as well as on reproductive powers and resistance to disease. Moreover mineral deficiencies can occur separately and apart from the supply of vitamins and calories, which depends on other factors. The connecting links between certain deficiencies and certain diseases are still obscure, but a connection there certainly is in many cases.

It is often said that local soil deficiencies are not significant because food in these days is brought from so many different areas in this and other countries. It is a reassuring theory and it may be true of some deficiencies and some diseases. However, it is not confirmed by the experience with goitre, which is prevalent in areas where the soil is

deficient in iodine. One of these areas exists in Ontario. Another is in Michigan, where the law now requires table-salt to be sold only in the iodized form. If the widespread distribution of food fails to correct a local soil deficiency of iodine, it is reasonable to suspect that the same thing can happen with respect to other deficiencies and other diseases of which little or nothing may yet be known.

The relationship between the soil and human health is under investigation at nine stations (located on different soil types) in the United States, notably at Cornell University, financed by the Federal Government. In Canada, very little has been done on this important subject. We cannot afford to overlook our own soil types.

What has been said indicates the need for fundamental long-term research. It is not enough to study human nutrition, animal nutrition, plant life and soils in separate compartments. The complex relationships between all four must also be unravelled. In the opinion of this Committee such a far-reaching inquiry would be national in scope and ought to be financed and undertaken by federal authorities, with whatever co-operation may be needed from provincial institutions, such as the Ontario Agricultural College and the Ontario Veterinary College.

CHAPTER 11

IRRIGATION

Shortage of water is one of the principal limiting factors in the production of crops in Ontario. Our annual precipitation is adequate, but undependable in the summer months. On practically every soil there is a period during the growing season when shortage of water retards growth.

Although irrigation may complicate the problem of fertility maintenance when the crops are removed, it assists in building up organic matter, because it is known that the natural level of organic matter rises with higher precipitation. Witness the increase in organic matter in Western Canada wherever rainfall is adequate. In Ontario, the low-lying fields are generally higher in organic matter than the uplands due to increased available moisture, among other reasons.

To date little experimental work on irrigation has been done in Ontario, other than on a few specialized crops - notably in orchards and vegetable gardens. Permission has been granted by the Greenmelk Company at Wallaceburg to quote the comparative yields of grass obtained in a series of plots when studying the economy of irrigation in relation to fertilization. These data, set out in the following table, illustrate the significant possibilities for increased yield and fertility due to moisture:

THE EFFECT OF IRRIGATION AND FERTILIZATION ON YIELDS OF GRASS IN 1948

Treatment	Pounds Dry Weight of Grass
1,000 lbs. 2-12-6 per acre with irrigation	4,050
No fertilizer with irrigation	1,940
1,000 lbs. 2-12-6 per acre without irrigation	1,000
No fertilizer without irrigation	930

It will be noticed that irrigation doubled the yield without fertilizer and that the yield was again doubled where fertilizer and irrigation both were applied. Where the fertilizer was applied without irrigation it was practically ineffective that season.

Evidence submitted at Vineland was to the effect that unless an irrigation system in the Niagara Fruit Belt is established, this highly productive area will eventually be unable to produce peaches economically.

There is urgent need for research and experimental work in the whole field of irrigation for many different forms of crop production in Ontario. Electric power, portable lightweight pipe and other modern developments have brought a tremendous increase in artificial irrigation on United States' farms, even on pasture fields. We cannot afford to lag behind.

CHAPTER 12

FARM UNDERDRAINAGE

Underdrainage on farmland is a private enterprise, undertaken for the improvement of the farm itself. It is therefore quite distinct from the outlet ditches and large drains which involve co-operation with the municipality and which affect a number of different properties.

The desirability of facilitating the drainage of potentially good agricultural land has been recognized for many years.

The Tile Drainage Act of 1878 permitted the farmer to borrow from the Province up to \$3,000 per 100 acres, but not more than 75 per cent of the cost of the work. Every year since 1878 such loans have been made. Advances to farmers by the Province on this account totalled \$4,607,705 up to 1949.

Extension work to promote underdrainage proceeded very intensively from 1912 to 1925 and it is felt now by the Drainage Division of the Ontario Agricultural College that most farmers realize its beneficial effects, which may be enumerated as follows: improvement of the physical condition of the soil; greater depth given the root zone which increases the available supply of plant food and moisture; more aeration of the soil, hence a warmer soil; reduced soil erosion, since much of the surplus water passes through the soil and not over it, and also earlier cultivating and seeding.

For farm drainage purposes, Ontario is divided by counties into five drainage districts, each with a drainage supervisor, four of which come under the Drainage Division of the Ontario Agricultural College, and one under the Kemptville Agricultural School. These five districts are as follows:
Niagara District - Lincoln, Welland, Haldimand, Oxford, Brant and Wentworth Counties; Western Ontario - Lambton, Kent, Essex, Middlesex and Elgin Counties; Central Ontario - Perth, Huron, Bruce and Grey Counties; South-central Ontario - Wellington,

Dufferin, Simcoe, Peel, York and Ontario Counties; and Eastern Ontario - all counties east of Peterborough.

The drainage supervisor of each district is in charge of making the farm drainage surveys, checking the construction of the drains, and acting in an advisory capacity on all tile drainage problems. Farmers who contemplate installing tile drains on their farms may apply to the supervisor who will conduct a survey of the farm and draw up a drainage plan. This service is provided at a nominal cost. The work conducted by the Drainage Division of the Ontario Agricultural College in one year, namely, 1946, is a typical example of what is being accomplished. It included 318 surveys, 9,764 acres surveyed and 2,593 acres drained.

Much evidence has been submitted urging an expansion of the planning and inspection service. In view of the fact that some faulty installation occurs every year, it seems necessary that farmers be protected against inferior work. A good survey is futile if the actual work is done improperly later. Sufficient trained assistance should be available to make possible inspections of all work in progress. This inspection would necessitate the taking of levels at short intervals on the tile installed before back-filling. No one can see by casual observation a rise or drop of an inch or two in the tile line, yet this would be enough to cause the system to function improperly. Often too, the tile are blinded. It appears that in the Niagara District inspection work has been generally demanded by the farmer, but it has been impossible to meet the demand because of the lack of help.

On this point, it is relevant to quote the findings of the Select Committee on Drainage of 1947:

"In further connection with The Tile Drainage Act, the view was strongly expressed that some provision should be made for an inspection of the tile drains, particularly as to levels, before the drain is back-filled, so that the Inspector could certify that the drain will do the work for which it is intended, and for the filing, along with the Inspector's report, of a plan of the drains. Under the present legis-

lation, the Inspector is required to certify only as to the number of rods of tile drain laid and the cost, but there is no requirement of a certificate that the work has been done in a satisfactory manner. From evidence presented to the Committee, it appears desirable that some provision such as suggested be incorporated in The Tile Drainage Act".

Under the Tile Drainage Act, the inspector appointed by the Township Council is required to have a plan, to report on the cost of the work, and give any other details required by the Council. In our opinion, he should at least be qualified to use a level, and be required to take levels at short intervals to determine grades, and thus protect the farmer and the Treasury Department, which purchases the debentures, against faulty installation. This Committee therefore recommends that:

THERE SHOULD BE AN EXPANSION OF THE PLANNING AND INSPECTION SERVICE PROVIDED BY THE DRAINAGE DIVISION AT THE ONTARIO AGRICULTURAL COLLEGE AND KEMPTVILLE AGRICULTURAL SCHOOL, and

THE TILE DRAINAGE ACT SHOULD BE AMENDED SO AS TO REQUIRE FROM THE INSPECTOR A CERTIFICATE THAT THE TILE DRAIN HAS BEEN PROPERLY AND SATISFACTORILY LAID AS TO LEVELS, AND WILL DO THE WORK EXPECTED OF IT, ALONG WITH A PLAN OF THE TILE DRAIN.

The expansion should be directed through the proposed regional soil laboratories under the Land Use Advisory Services explained in detail in the chapter of this report on Agricultural Services.

At the present time no specifications for the manufacture of tile are being enforced. The result is that there is at times poor tile - soft, burned, warped, poorly cut or with a high percentage of limestone - coming on the market. This Committee recommends that:

PROVISION SHOULD BE MADE IN THE TILE DRAINAGE ACT

FOR REGULATIONS TO BE MADE ESTABLISHING STANDARDS AND SPECIFICATIONS FOR TILE DRAINS, BOTH CLAY AND CONCRETE, WITH WHICH TILE MANUFACTURERS WILL BE REQUIRED TO COMPLY, and

A LICENSING AND INSPECTION SERVICE FOR TILE MANUFACTURING PLANTS SHOULD BE ESTABLISHED TO ASSURE MINIMUM STANDARDS OF QUALITY FOR AGRICULTURAL TILE.

Little or no research work in drainage has been done in Ontario. Depths and spacing of tile have been usually guided by local practice, and what seems to give satisfactory results in that particular locality. Many factors have been suggested to be contributory to tile failure, such as the use of heavy machinery, loss of organic matter, poor physical condition of the soil, and what is perhaps more important - poor installation. It is suspected that bacterial growths at the tile joints are sometimes responsible for sealing them. Systematic research on these problems would be in the interest of better drainage and of soil conservation. This Committee therefore recommends that:

DRAINAGE DEMONSTRATIONS AND RESEARCH SHOULD BE CONDUCTED ON THE MAJOR AGRICULTURAL SOIL TYPES OF ONTARIO.

CHAPTER 13

MUNICIPAL DRAINAGE

Drainage of many farm lands in Ontario depends on finding a satisfactory outlet. In most cases this necessitates the construction of a large ditch affecting two or more properties. Usually it is in the interest of the municipality concerned to promote the project, for it will increase assessment and revenues.

There is a great deal of provincial legislation to which reference is made in drainage matters. Since 1866 there have gradually evolved a number of statutes which govern municipal drains, the three most important being as follows:

(a) The Municipal Drainage Act which provides that a majority of farmers benefitting from a proposed drainage scheme may petition the council of the municipality to construct the drain. An engineer is appointed to survey the scheme, estimate the cost (to be assessed back to the beneficiaries of the scheme) and report to the council.

(b) The Municipal Drainage Aid Act permits a council to borrow money for the construction of a drainage project.

(c) The Provincial Aid to Drainage Act authorizes the government to assist municipal drainage schemes by assuming 20 per cent of the cost if it exceeds \$5,000.

There were a number of amendments to the legislation in 1949, following the report of the Select Committee appointed by the Legislature in 1947 to investigate drainage.

Drainage under the above legislation has brought much valuable land into production. However, the whole trend of these measures is to move water off the land as quickly as possible, often without sufficient regard for the capabilities of the land drained or the effect on the downstream area. An example is the draining of the Luther Marsh, at the headwaters of the Grand River, which was a mistake.

Under recent legislation, a Conservation Authority

may appeal against any drainage scheme within its jurisdiction on the ground that it would have detrimental effects on the watershed area.

Drainage projects are sometimes undertaken without enough attention being paid to considerations which may be outside the sphere of interest of the engineer or the accountant. Questions of land use capability, forestry, ground water supply and the like may be of importance. There is also the problem that sometimes a scheme which benefits one group of property-owners may injure the interests of another group, or such may be their belief.

This Committee has come to the conclusion that there ought to be a procedure whereby any landowner affected by a drainage scheme could appeal against it on the ground that it does not conform to or would adversely affect proper land use and conservation in the area. Moreover, when a Council considers a drainage scheme it should have not only a report on the engineering and financial aspects of the proposal, but also some evidence as to its merits or demerits, having regard to agricultural potential, land use and conservation.

Some of the representations made to this Committee disclosed a misunderstanding of the relationship between drainage and conservation. There need be no conflict between a project for improving by drainage lands with a high agricultural potential and the principle that poorly drained areas of low agricultural potential should remain in their natural state. Both represent applications of sound land use.

It must be admitted that mistakes have been made in draining marginal or sub-marginal wet lands. These should not be charged against drainage but rather against our failure in past years to obtain land use surveys evaluating the lands in question. If soil surveys and land use capability maps were generally available, they could greatly assist a municipal council or referee in making wise decisions about drainage schemes.

Where mistakes have been made, or where maintenance of the drain proves to be economically unsound, there should be a procedure for rectifying the error. There is at present no legislative authority enabling a Council to repeal a by-law passed under the Municipal Drainage Act, even where all are agreed that a mistake has been made. The Act should be amended accordingly.

There is much potentially productive land in Eastern Ontario requiring drainage. It was represented to this Committee that municipal councils and township clerks in that region are in many cases not well enough acquainted with the present drainage statutes and the benefits available thereunder. Furthermore, Eastern Ontario at present lacks an adequate supply of civil engineers and contractors. It appears that there is real need for greater provincial assistance that would accelerate soundly conceived drainage projects, not only in the East and the North but on any lands where the agricultural potential is relatively high. Provincial assistance must of necessity be more generous in the territorial districts and in areas lacking any municipal organization than in the well-settled and highly-developed sections of Ontario.

With these considerations in mind, it is recommended that:

1. THE MUNICIPAL DRAINAGE ACT SHOULD BE AMENDED TO
 - (A) PROVIDE THAT AN ENGINEER REPORTING TO COUNCIL SHOULD BE REQUIRED TO INCLUDE AN OPINION ON THE MERITS OF THE PROJECT IN THE LIGHT OF LAND USE AND CONSERVATION PRINCIPLES, and
 - (B) GIVE ANY LANDOWNER AFFECTED THE RIGHT OF APPEAL AFTER THE ADOPTION OF AN ENGINEER'S REPORT, ON GROUNDS RELATING TO LAND USE OR CONSERVATION, AS WELL AS THE PRESENT GROUNDS, and
 - (C) PROVIDE FOR THE ABANDONMENT OF DRAINAGE SCHEMES WHERE MAINTENANCE IS FOUND TO BE UNSOUND OR UNECONOMIC.

2. PROVINCIAL SUBSIDIES ON THE CONSTRUCTION, IMPROVEMENT OR RECONSTRUCTION OF THE TRUNK CHANNEL OR CHANNELS, (EXCLUDING LATERAL DRAINS OR BRANCHES BUT INCLUDING A PRO RATA SHARE OF ALL INCIDENTAL EXPENSE) SHOULD BE APPLIED TO ALL SUCH WORKS, INCLUDING THOSE COSTING LESS THAN \$5,000.

3. SUCH SUBSIDIES SHOULD BE GRANTED ON THE FOLLOWING SCALE:

(A) IN THE COUNTIES - 33 1/3 PER CENT;

(B) IN THE MUNICIPALITIES OF THE TERRITORIAL DISTRICTS - 66 2/3 PER CENT;

(C) IN THAT PART OF THE TERRITORIAL DISTRICTS NOT WITHIN A MUNICIPALITY - UP TO 80 PER CENT.

There is much more involved in a drainage problem than engineering, financial or legal questions. It has been strongly represented to this Committee that controversial cases should be dealt with on appeal by a tribunal qualified to assess agricultural and land use considerations. At present the drainage referees must be experienced barristers in good standing. It is not to be expected that a lawyer, or even an engineer, could appreciate the full significance of a drainage scheme, particularly in relation to agricultural potential and the effect on other lands in the watershed. There is evidence that some disputes in the past have been decided on legalistic or engineering grounds without sufficient regard to the paramount importance of most wisely utilizing the soil and water resources of the area affected.

Moreover, this Committee is of the opinion that disputes which are appealed should be dealt with by a provincial tribunal, so as to assure uniformity of practice in the light of the provincial conservation policy. The most appropriate tribunal appears to be the Ontario Municipal Board. That body already includes legal and engineering talent, which should now be balanced and strengthened by the appointment of a conserva-

tionist specially qualified in land use and the agricultural sciences. It is therefore recommended that:

THE GOVERNMENT SHOULD EXERCISE ITS POWER UNDER SECTION 93A OF THE MUNICIPAL DRAINAGE ACT TO DESIGNATE (INSTEAD OF INDIVIDUAL REFEREES) THE ONTARIO MUNICIPAL BOARD AS SOLE DRAINAGE REFEREE FOR THE PROVINCE, and

THE GOVERNMENT SHOULD APPOINT TO THE ONTARIO MUNICIPAL BOARD A CONSERVATIONIST SPECIALLY QUALIFIED IN LAND USE AND THE AGRICULTURAL SCIENCES.

The intention is that the Board should exercise the power to veto a drainage scheme if the evidence showed it to be contrary to sound conservation principles.

As already mentioned, a large number of statutes directly or indirectly relate to drainage. Of these there are five of primary importance with which municipal officials and others interested in drainage are supposed to be familiar:

1. The Municipal Drainage Act.
2. The Municipal Drainage Aid Act.
3. The Provincial Aid to Drainage Act.
4. The Tile Drainage Act.
5. The Ditches and Watercourses Act.

The last-named is fundamentally a "one-man" Act, its purpose being to enable one man to secure an outlet on somebody else's property, while the Municipal Drainage Act is a "majority" Act, being devised to enable the majority of those benefitting to get certain work done.

The Ditches and Watercourses Act is rapidly falling into disuse and will probably die a natural death. Under its provisions each owner benefitting has to do part of the actual work. In earlier days it was popular, but today it is more satisfactory to get the whole job done as a unit under the Municipal Drainage Act. However, this Committee is not prepared to recommend that the Ditches and Watercourses Act be

jettisoned as yet, for it may prove useful in the odd case.

The five statutes named above, all relating directly to drainage, have been amended and re-amended throughout the years. They now constitute a maze of technicalities through which even an expert may have difficulty in finding his weary way. There is no valid reason for being obliged to consult five different and difficult Acts instead of one. The complexity of the arrangement perhaps accounts for the misunderstandings or ignorance of the law frequently attributed to municipal officials. This Committee has come to the conclusion that all five statutes, including The Ditches and Watercourses Act, ought to be consolidated and co-ordinated into one Act - probably known as "The Drainage Act - and, if possible, the language should be clarified and simplified. If this worthy enterprise is undertaken without delay the new Act could appear in the forthcoming Revised Statutes of Ontario, now under preparation.

It is recommended that:

THE FIVE PRINCIPAL STATUTES RELATING TO DRAINAGE
SHOULD BE CO-ORDINATED AND CONSOLIDATED INTO ONE
DRAINAGE ACT.

Two interesting suggestions were made by the Select Committee of 1947, as follows:

"The Committee is definitely of the opinion that a great deal of the trouble with water lying on fields on farms could be alleviated by the construction of shallow open ditches to take off the water lying on the surface. Under modern mechanical methods of farming, it is desirable that large fields be utilized, and the digging of shallow open ditches over which cultivation machinery could operate would serve the useful purpose of removing surface water without interfering with the continuity of mechanical farming operations. The Committee feels that a program of education on the value of these shallow, open ditches would be of great value in sections of the Province where there are large sections of flat land.

"The Committee also finds that maintenance of all types of ditches has been very badly neglected all over the Province, with a result that they have in many cases become overgrown with weeds and brush, have become filled in, and they are not fulfilling the purpose for which they were constructed in the first instance. Many of the

drainage problems encountered could be alleviated by a vigorous campaign for cleaning out these ditches, and putting them back in condition to do the job of drainage that is required".

This Committee is inclined to agree with a proposal that all drains and ditches should be officially recorded.

The problem was explained as follows by the 1947 Drainage Committee:

"The Committee, at all of its meetings, heard complaints regarding the lack of proper records of drains and ditches. It was pointed out that in many cases, owing to improper filing and storage of records, there is great difficulty in securing copies of the original drainage records. Various suggestions were made as to the filing of these records, and the Committee would strongly urge that township clerks be supplied with proper filing cabinets for the storage of these records in an easily available form, and that the Department of Municipal Affairs set up a set of instructions on the filing of records by township clerks, and conduct courses of training for such officials on the same subject. It was also felt that it would be of value to have a second copy of all awards under The Ditches and Watercourses Act filed in the County Registry Office".

This Committee therefore recommends that:

DRAINAGE LEGISLATION SHOULD BE AMENDED TO REQUIRE THAT COPIES OF ENGINEERS' REPORTS IF ADOPTED, PLANS, AWARDS, REFEREES' DECISIONS AND ADEQUATE RECORDS RELATING TO ALL DRAINS AND DITCHES SHOULD BE FILED WITH TOWNSHIP CLERKS AND REGISTERED WITH RESPECT TO THE LANDS AFFECTED IN COUNTY REGISTRY OFFICES.

CHAPTER 14

CO-ORDINATION OF AGRICULTURAL SERVICES

The basic problem is to bring about the right use of land to assure a permanently productive agriculture. Land may be classified in three main categories:

1. Land suitable for rotation cropping,
2. Land suitable only for continuous grass,
3. Land suitable only for forestry.

Land in the first two categories above are farm lands. They are the concern of the agricultural scientists and specialists in agriculture. Land in the third category is the concern of the forester.

Agricultural lands are usually interspersed with areas of non-agricultural land in close association. Indeed, there are a great many farms on which can be found land in all three categories mentioned above. This means that a program for sound land use and soil and water conservation will call for the close co-ordination and co-operation of the agriculturist and the forester at all times. They must work together as a team, in harmony and towards one objective - the best use of our land resources.

These considerations have to be kept in mind when examining the functions of the agricultural representative and the forester, and also the institutions and services which stand behind these men. It should be understood that the Department of Agriculture, through its Extension Division, already has representatives (and in some cases assistant representatives) serving in every county and district of the Province. The Department of Lands and Forests has also placed extension men - zone foresters - not in every county, but at strategic points throughout Southern Ontario.

Behind these men stand the soil-testing laboratories the research facilities, the specialized knowledge of institutions like the Ontario Agricultural College and the Ontario Veterinary College, as well as the laboratories and nurseries

of the Department of Lands and Forests. Without such technical backing, extension work for conservation purposes would be feeble indeed. The stronger such backing can be the more effective extension work will be.

The first step toward sound conservation is to decide in which of the three categories any given parcel of land belongs, and then to make intelligent use of that land in accordance with its natural capabilities. In some cases the answer is obvious. In others it becomes a technical question: soil tests must be taken, the agricultural representative should be called in, and he in turn must be able to get prompt and full laboratory reports and advice from the scientists who stand behind him.

Having properly classified the land, it is necessary for the farmer to know and understand the practices appropriate to each category. In the case of agricultural land, whether suitable for rotation farming or continuous grass, the fundamental necessity is to follow practices which tend to conserve both soil and water.

These practices, however, may vary - and do vary considerably - with different soil types and different climatic conditions, which again serves to remind us of the importance to both the farmer and his agricultural representative of having access to the scientific resources of government experimental farms and agricultural colleges. Farming can no longer be a hit-and-miss business, it is a highly technical profession, calling for a high degree of intelligence and resourcefulness. The farmer, no less than the manufacturer, must have access to the findings of science.

The soil and its productivity are the basis of farming. Crops depend on the soil for 12 essential nutrients for normal sustenance. Livestock depend on the crops they consume for the proteins, minerals and vitamins required for growth and reproduction. Man in his turn depends on food crops, livestock and livestock products for his own nourish-

ment, strength and vitality. Thus soil conservation - the maintenance of soil fertility - is basic to our whole economy. It surely deserves a careful and substantial investment.

Crops and livestock of course are subject to disease, insect attack and other pests. The control and prevention of these factors is a vital part of any conservation program. For example, the year's investment in fertilizer, green manure and other instruments of conservation farming may be lost if the crop is wiped out by a visitation of insects. Yet a previous investment in scientific research may enable the farmer to avert that loss.

Thus it is clear that the farmer or landowner wishing to adopt the fullest measures of conservation on his land must have direct or indirect access to a variety of specialists. True conservation involves soils, crops, livestock, insects, plant and animal diseases, agricultural engineering, silviculture, to mention only a few. There is hardly a science that could be named which does not have a contribution to make to conservation.

Not only is it necessary for the citizen to have access, directly or indirectly, to the rich store-houses of science, it is also important that the scientists should have adequate physical facilities for rendering the maximum service. It is further of great importance that the background and training of the scientists themselves should be of the highest quality.

Co-ordination of Institutions

All that has been said will illustrate the enormous importance to conservation of the Ontario Agricultural College and the institutions associated with it.

This Committee has given careful and lengthy consideration to the problem of co-ordinating agricultural services so that they may reach their maximum effectiveness, and to the problem of enabling the nerve centre of all such services to exercise that function most successfully.

So far as agricultural conservation is concerned, where is the nerve centre of all the necessary education, research and technical advisory services? The answer must be: at Guelph, where the Ontario Agricultural College and the Ontario Veterinary College already have the basic resources of library, laboratory, teaching, research, publication and extension facilities and personnel. These two institutions by their existing resources are certainly qualified to become the base or headquarters for all conservation work in agriculture.

It is recognized that both institutions already carry tremendous responsibilities. With budgets that are modest compared with those of similar institutions in the United States, the staff at Guelph are required to carry on:

1. Vocational training, in the "short courses",
2. Professional or scientific training, in the degree courses,
3. Long-term and short-term research projects.
4. Laboratory services such as soil-analysis and autopsies,
5. Extension work, both by publication and visitation.
6. Field service, e. g., drainage surveys on individual farms,
7. Advisory service, by correspondence and telephone,
8. General educational work and practical demonstrations for scores of groups and thousands of individuals visiting the campus each year.

No other college or university is called upon to render such diversified and continuous services to the public. By reason of the heavy demands presently imposed on the institutions at Guelph, it is clear that expansion and increased support will be necessary to enable them to assume successfully their proper role in a conservation program for Ontario.

To assume the role of a base or headquarters, to meet adequately the future needs of an expanding program in better land use, soil and water conservation, crop and live-stock improvement, insect pest and disease control, economical mechanization and efficient farm planning and farm management,

some integration and co-ordination of existing units is assuredly necessary.

It is not possible to discuss such matters in detail, but this Committee has unanimously reached certain conclusions about the form which integration and co-ordination should take. This will be made clear in basic principles by the recommendations which follow.

The first necessary step is to strengthen the structure of the existing institutions at Guelph, so that they will be organizationally prepared to assume greater stature. They are now the Ontario Agricultural College, the Ontario Veterinary College and the Macdonald Institute of Home Economics, all supported by the Province. (This Committee regrets that the School of Forestry is not also located at Guelph.) To be adequately prepared for the future, the three should be co-ordinated. It is therefore recommended that:

THE ONTARIO AGRICULTURAL COLLEGE, THE ONTARIO VETERINARY COLLEGE AND THE MACDONALD INSTITUTE OF HOME ECONOMICS SHOULD BE FEDERATED INTO ONE EDUCATIONAL INSTITUTION UNDER A PRESIDENT AND THREE DEANS, NAMELY, A DEAN OF AGRICULTURE, A DEAN OF VETERINARY SCIENCES AND A DEAN OF HOME ECONOMICS.

Whether the new federated body should be accorded the status of a university, whether it should continue to be affiliated, as at present, to the University of Toronto for degree-granting purposes - these are questions which may be decided at a future date in the light of further experience.

This Committee believes that it is desirable at this time to take full advantage of presently untapped sources of support and encouragement. It is therefore recommended that:

THERE SHOULD BE A BOARD OF REGENTS FOR THE FEDERATED INSTITUTIONS CONSISTING OF 12 MEMBERS WHOSE DUTY IT

WOULD BE TO STUDY AND MAKE RECOMMENDATIONS ON
MATTERS OF POLICY, ADMINISTRATION AND FINANCE.

The Board of Regents should be appointed by Order-in-Council on recommendation of the Minister of Agriculture. Members should be selected in the numbers suggested below from a panel submitted by five organizations which are vitally concerned with the future of agriculture:

Ontario Federation of Agriculture	5 members
Ontario Agricultural College Alumni Association	3 members
Ontario Veterinary College Alumni Association	2 members
Macdonald Institute Alumni	1 member
Federated Women's Institutes of Ontario	1 member
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Total	12 members.

In addition, the Deputy Minister of Agriculture and the President of the federated institutions should be ex-officio members of the Board.

It is further suggested that the above-named organizations, when submitting their panel, should name three times the number to be appointed.

In order to assure continuity of constructive policy, it is recommended that:

THE BOARD OF REGENTS IN THE FIRST INSTANCE SHOULD
BE APPOINTED FOR STAGGERED TERMS OF TWO, THREE AND
FOUR YEARS RESPECTIVELY.

The Board itself should appoint from among the members a Chairman and executive officers. Members should receive a per diem allowance for expenses.

It would be the responsibility of the Board to study all phases of overall policy. In consultation with the President, policy and plans should be formulated. It should also be the function of the Board to place its annual program before the Government through the Minister of Agriculture, so that adequate provision may be made each year for financial and other support of such a well-considered program. Upon

acceptance of the program by the Government, it would naturally be the duty of the Board to see that it is fully implemented.

This Committee believes that, with such changes in organization, the institutions at Guelph could better discharge the vast responsibilities which await them.

Co-ordination of Extension

The appointment of agricultural representatives, in co-operation with the counties, began in 1907. Since that time the Extension Service of the Department of Agriculture has steadily grown in influence and usefulness. This Committee has had ample evidence that the work of the agricultural representatives is highly valued by farmers and there is a considerable demand for vigorous expansion. Much of the evidence from farmers and farm organizations also indicated it is desirable that the extension forces in agriculture should be more closely linked to the facilities for research, publications and education which are presently divided between Guelph and Toronto. It is therefore recommended that:

THE DIRECTOR OF EXTENSION FOR AGRICULTURE AND ALL AGRICULTURAL OFFICIALS, OTHER THAN THOSE ENGAGED IN THE ADMINISTRATION OF LEGISLATION OR IN INSPECTION, SHOULD BE TRANSFERRED FROM TORONTO TO GUELPH TO FACILITATE CLOSE CO-OPERATION WITH THE APPROPRIATE DEPARTMENTS OF THE FEDERATED INSTITUTIONS, and

THE DIRECTOR OF EXTENSION SHOULD REMAIN DIRECTLY RESPONSIBLE TO THE DEPUTY MINISTER OF AGRICULTURE AS AT PRESENT TO FACILITATE THE DIRECT CO-ORDINATION OF EXTENSION WORK AMONG THE FEDERATED INSTITUTIONS AT GUELPH, THE AGRICULTURAL SCHOOL AT KEMPTVILLE, THE HORTICULTURAL EXPERIMENT STATION AT VINELAND AND THE WESTERN ONTARIO EXPERIMENTAL FARM AT RIDGETOWN, and

THE DIRECTOR OF EXTENSION SHOULD HAVE SUPERVISION

OVER ALL THE COUNTY OFFICES OF THE DEPARTMENT OF AGRICULTURE AND IN ADDITION SHOULD DIRECT THE WHOLE PROGRAM OF AGRICULTURAL EXTENSION IN ONTARIO, and ALL EXTENSION AT THE COUNTY OR FARM LEVEL SHOULD BE INTEGRATED WITH AND CO-ORDINATED THROUGH THE AGRICULTURAL REPRESENTATIVES IN THE COUNTY OFFICES, SO THAT EXTENSION STAFF FROM ANY DEPARTMENT OF THE FEDERATED INSTITUTIONS AT GUELPH OR THE WESTERN ONTARIO EXPERIMENTAL FARM AT RIDGETOWN, THE HORTICULTURAL EXPERIMENT STATION AT VINELAND OR THE KEMPTVILLE AGRICULTURAL SCHOOL, WOULD WORK THROUGH THE COUNTY OFFICES OF AGRICULTURAL REPRESENTATIVES.

This Committee is much impressed with the value of films and radio for conservation purposes. Many farmers and their families never get the opportunity to visit experimental farms or similar demonstrations of modern practice. The message can be taken to them in their own locality by picture and radio. The indications are that television may soon be available in Ontario also. It is recommended that:

EXTENSION WORKERS SHOULD BE GIVEN SPECIAL TRAINING IN THE USE OF RADIO AND EVENTUALLY TELEVISION FOR PROMOTION OF THE CONSERVATION PROGRAM, and

A LARGER SERIES OF SUITABLE CONSERVATION FILMS SHOULD BE PREPARED AND MADE AVAILABLE FOR THE WIDEST POSSIBLE SHOWING NOT ONLY BY EXTENSION WORKERS BUT ALSO BY SCHOOLS AND INTERESTED ORGANIZATIONS.

At present an Assistant Agricultural Representative can look forward to appointment as a Representative when another County falls vacant, which frequently occurs just when he is becoming most useful to the people among whom he served his apprenticeship. At almost every hearing of this Committee in rural Ontario, farmers stressed the fact that

Representatives are overloaded with existing demands and commitments. It is difficult to imagine how they could undertake any more unless the work were re-organized. Yet an extended and accelerated conservation program must of necessity depend in large measure on the County Agricultural Representatives for leadership and organization. It is recommended that:

ASSOCIATE REPRESENTATIVES SHOULD BE APPOINTED WITH SALARIES CORRESPONDING TO THOSE OF REPRESENTATIVES SO THAT THEY MIGHT REMAIN FOR LONGER PERIODS IN THE COUNTIES WHERE THEY BECOME FAMILIAR WITH LOCAL CONDITIONS, and

EXTENSION WORK IN CONNECTION WITH BOYS' CLUBS AND THE LIKE SHOULD BE CONDUCTED BY SPECIALLY TRAINED CLUB LEADERS ON A REGIONAL RATHER THAN A COUNTY BASIS, THEREBY RELEASING REPRESENTATIVES AND THEIR ASSOCIATES OR ASSISTANTS FOR CONSERVATION WORK.

It is believed that these two recommendations, if implemented, would go far towards relieving present Representatives of multifarious duties requiring much time and effort, thus permitting them to plan and pursue local conservation activities in co-operation with the local farmers and organizations.

Demonstration Farms

At all the rural hearings held by this Committee farmers and farm organizations recognized the value of Experimental Farms, both Dominion and Provincial, and their great contribution to improved agriculture.

Experimental Farms, however, are essentially scientific laboratories and their methods and procedure of doing research work supported by public funds are not open to the average farmer.

Demonstration Farms are a different matter. All

were agreed that demonstration or model farms operated at government expense do not satisfactorily meet the need. What is needed is demonstration of what the average farmer can do in the average farmer's circumstances, which of course are very different from those of the subsidized farm.

This means that demonstrations must be carried out by a practising farmer as a practical proposition on his own land. A financial exception could be made for a special demonstration of "what not to do", which might be staged on one field or a plot of an average farm, and for which it might be necessary to compensate the owner.

The Dominion Government already gives guidance to a number of "Illustration Stations" which are operated by the owner under an agreement with the Central Experimental Farms.

This Committee believes that a highly effective medium for demonstration has come into being in Ontario. The County Crop Improvement Associations are voluntary bodies actively engaged in the promotion of better farming, and they are linked together in a strong provincial organization. In these Associations it is the farmers themselves who are taking the initiative, and they are beginning to show what magnificent conservation work can be organized by the farmers themselves.

For example, the Middlesex Crop Improvement Association has an ambitious and constructive program for 1950. This organization of practical farmers states "Our Aim" as follows:

"Stressing the grave need and bringing to the foremost attention of every farmer in Middlesex the urgency of Soil Restoration, i. e., restoring the organic matter and soil fertility of his soil, increasing yields per acre, lowering costs of production, and conserving for future use Middlesex topsoil".

The Middlesex Association, at an estimated cost of \$4,000 (of which \$1,000 is a provincial grant), plans three useful projects for 1950.

Project No. 1, "Hunger Signs in our Crops and Fertility Management", involved 60 greenhouse flats containing wheat, oats, barley, corn, soybeans, white beans, permanent pasture and tobacco. Seven completely different illustrations replicated on each variety would show starvation and plant food hunger signs (the symptoms of soil depletion) with appropriate soil correction methods.

Project No. 2, "Sponsoring a Complete Soil Testing and Plant Cell Tissue Testing Program", involves soil testing every Middlesex farm in 1950, spring and summer, with check work in August and September.

Project No. 3, "Field Experiments and Demonstrations" involve 30 five-acre experiments and demonstrations on a 1, 2, 3 or 5-year basis depending on type, allocated two to each township in Middlesex, the farmer himself to do most of the work, with the assistance of a Township Committee man and the supervision of a Soils Fieldman to be employed for part of the year by the County Association.

What has been outlined above represents this Committee's view of effective practical demonstration work at the community level, sponsored and promoted by local people with the assistance of the Agricultural Representative and a government grant. This project appears to be coming from the grass roots and not from the top down, which means that it is likely to be successful.

Building on the base of local activity and interest, it must become possible to establish "pilot farms" which would show the way for their neighborhoods in sound conservation farming. Owned and operated by practical farmers, spurred on by local community interest and technical assistance, these pilot farms could make a great difference to agriculture. This Committee believes they can be most effectively promoted through the County Crop Improvement Associations. It is therefore recommended that:

IN CO-OPERATION WITH THE COUNTY CROP IMPROVEMENT ASSOCIATIONS, EVERY ENCOURAGEMENT AND ASSISTANCE SHOULD BE GIVEN TO PROMOTING SPECIAL DEMONSTRATION PROJECTS AND "PILOT FARMS", OPERATED BY PRACTISING FARMERS, WHICH WOULD APPLY THE FINDINGS OF RESEARCH IN A PRACTICAL WAY UNDER LOCAL LEADERSHIP WITH SUCH TECHNICAL ASSISTANCE FROM THE LAND USE ADVISORY SERVICES AS MAY BE NECESSARY.

Laboratories

A feature of the expanding extension program is the proposed establishment of regional soil and veterinary science laboratories. This need arises because many important farming areas are too far away from existing laboratories at Guelph, Kemptville, Vineland and Ridgetown.

In the interests of efficiency and economy, these and any other regional laboratories should be housed, so far as possible, in the same building at each regional centre. They will be discussed under two headings:

- (1) Land Use Advisory Services.
- (2) Veterinary Laboratory Services.

(1) Land Use Advisory Services

It is essential that the service work extended by the Department of Soils at Guelph be done in co-ordination with County Agricultural Representatives. This can be accomplished under the supervision of the Director of Extension, and carried into the field by the Land Use Advisory Services, working in close conjunction with the County offices on farm problems. The Land Use Advisory Services would include:

- (a) Soil Management Advisory Service,
- (b) Farm Planning Service,
- (c) Drainage Surveys Advisory Service.

To permit and to assure close co-ordination of all activities connected with each of these services, the super-

visor of each should be directly responsible to the staff member in charge of the Land Use Advisory Services. It is proposed that there be nine regional soils laboratories, seven in Southern Ontario and two in Northern Ontario.

(a) Soil Management Advisory Service

In order to maintain the soil testing and advisory service at a uniformly high level, there should be a supervisor with headquarters in the Soils Department at Guelph, who would investigate and standardize methods, keep abreast of research, and give guidance, assistance and direction to the field men.

The regional laboratories of course would be fully equipped for soil testing. Each would require a field man to carry on field demonstrations, give advice to farmers on soil problems and make recommendations based on soil test data. The field men would have to work in close touch with County Agricultural Representatives and with other field men engaged in farm planning and drainage problems. The field men would also be required to give short courses in rural communities as well as some teaching with students who take a two-year diploma.

(b) Farm Planning Service

Farm planning of the type involving special erosion control measures (for which there is at present considerable need and demand) will require specially trained personnel, including one senior staff member, all with headquarters in the Soils Department at Guelph.

These men also will have to work closely with the Drainage and Soil Management field men and the County Agricultural Representatives. It is through these latter in the field that the request for special types of service may be expected to come. The Agricultural Representative, thoroughly familiar with his own area and its people, is in the nature of a "general practitioner", and he will know where to turn and when a farmer needs a specialist or consultant.

Consultation with other specialists in the Departments of Agricultural Economics, Field Crops, Animal Husbandry and Agricultural Engineering will bring assistance on specific problems such as costs, varieties, breeds, feed requirements, terracing, water control, farm ponds, the lay-out of farm fields and fences, etc.

(c) Drainage Surveys and Advisory Service

As land drainage is a part of soil development, utilization and conservation, it is thought that, to be efficient, service of this kind should be included among the Land Use Advisory Services. This will permit very necessary co-ordination with the other factors in land use and the fullest information from other field men and the County Agricultural Representatives. For example, soil tests will assist the drainage expert in preparing a tile drainage plan. Moreover, field drainage experiments can be carried out most effectively by drainage field men with help and guidance from other field men working on fertility and farm planning problems as well as the field parties engaged in soil surveys.

In concluding this explanation of the proposed Land Use Advisory Services, it may be pointed out that the establishment of regional laboratories collaborating with field men and County Representatives would encourage farmers to band together and undertake innovations in land use practices on their farms which could be of great mutual benefit. After all, the finest government services will not avail unless the man on the land takes advantage of them. When the United States Department of Agriculture embarked on an ambitious soil conservation and extension program some 15 years ago, it met with little response at first from farmers, despite the generosity of the Government. It was not until machinery was established whereby the farmer, or groups of farmers acting together, could take the initiative in commencing improved agriculture, that real progress in soil

conservation was achieved. There is already much evidence that this initiative exists on the part of Ontario farmers who have been requesting land use advisory services, which, due to lack of personnel and organization, have not been available.

(2) Regional Veterinary Laboratory Services

The veterinary sciences have been making great gains. Ontario has the advantage of a college and research centre at Guelph which is the only advanced institution of its kind in Canada and draws students from every province and many other countries.

In recent years important diagnostic methods and a wealth of new information have been developed as a result of scientific research. These demonstrate the futility of any field consultation service unless supported by adequate laboratory backing. To be of any value, many of the investigations required will necessitate prompt laboratory results, not in a few days' time but in a matter of hours. If, for example, a flock of 10,000 hens are attacked by a mysterious disease, diagnosis must be swift, not only to assist the owner but to protect other poultrymen in the whole area.

It is impossible, under these conditions, for the laboratories at Guelph to serve the whole province. The Minister of Agriculture has provided for new laboratories at (a) Kemptville, (b) Kingston, (c) a centre in Northern Ontario. Although authorized, the latter two are not yet in operation, due to a shortage of trained personnel.

Further to assure that field consultation will have adequate laboratory support, it is recommended that:

IN ADDITION TO THE VETERINARY LABORATORIES SOON TO BE ESTABLISHED AT KEMPTVILLE AND KINGSTON, A THIRD LABORATORY SHOULD BE ESTABLISHED AS SOON AS PERSONNEL ARE AVAILABLE IN NORTH-WESTERN ONTARIO, A FOURTH IN BRUCE OR GREY COUNTY AND A FIFTH AT RIDGETOWN.

CHAPTER 15

AGRICULTURAL RESEARCH

Many forms of research are discussed elsewhere in this report. At this point, it seems necessary to make special mention of some of the actualities and potentialities of agricultural research work at Provincial Institutions.

Agricultural research, wisely conceived and competently executed, is the foundation of all sound programs of education and extension. Without it the extension worker would in the long run be of little value to the farmer.

Current Program

In January, 1950, there were 335 individual research projects actively under way at our agricultural institutions. These were distributed as follows:

Ontario Agricultural College, Guelph	241 projects
Ontario Veterinary College, Guelph	22 "
Horticultural Experiment Station, Vineland	62 "
Farm Economics Branch, Toronto	10 "

A survey of the present program indicates that study and investigation of the more important problems in each field are being undertaken, and that research workers are closely in touch with the problems at the farm level. As such, most of the research projects carried on at the Ontario Agricultural College are of the "applied" type, and of an investigational nature directed at obtaining immediate practical results. Such studies are of course commendable.

However, certain long-term fundamental research that is required on many of our agricultural problems, although not overlooked, is decidedly limited by inadequate resources. Too often it has been the practice, when annual estimates are considered, to make reductions in the field of fundamental research, which, although not yielding immediate practical results, is the very heart of a research program. It is from such fundamental research that new approaches, investigations

and solutions of agricultural problems are created.

With the recent appointment of a Director of Research, whose headquarters is at Guelph, steps are being taken to bring about the fullest co-ordination of effort among the various Branches and Departments, to avoid duplication of effort and expenditures, and to insure effective team-work in group research where possible.

Larger projects such as Potato Scab Research and Legume Seed Setting Research are organized under special committees which include representatives from the Dominion Experimental Farms Service, and from the Dominion Science Service as well as from various Departments of the Agricultural College. This type of "group" research is becoming more common as its advantages become better appreciated.

The Research Council of Ontario, through its Advisory Committee on Agricultural Research, assists in the co-ordination of agricultural research, and also in the training of research specialists by awarding scholarships for graduate students in Agriculture. The Research Council has also offered to support the expansion of the agricultural research program with grants-in-aid for special projects, particularly in fundamental investigation.

Capacity for Expansion

Having regard to the present teaching load at the undergraduate level, the personnel available for part-time or full-time research, and the physical facilities (such as laboratory space and equipment), the present program of projects is all that can be carried in most Departments of the Ontario Agricultural College and the Ontario Veterinary College. Any expansion of the research program in either institutions would require additional qualified research workers, and some additional laboratory and other assistants. In the case of the Veterinary College, more laboratory space and apparatus are both needed before a larger research program can be undertaken.

The completion, this winter, of the new Fruit Products Research Laboratory at the Horticultural Experiment Station, Vineland, will provide additional space and equipment for an expanded program there. Further specialist personnel, however, will be needed to staff the new laboratories.

Needs for the Future

Because farming is constantly faced with new problems which are of great complexity and touch many different sciences and the making of adjustments in organization and operation, the agricultural research program must be a continuing program. It can never be static. Problems must be worked at until the answers are forthcoming, no matter how difficult or discouraging they may be. Ontario agriculture cannot wait for some other province or country to do our research work for us. Ontario must carry its own responsibility for active research on its own problems. Thus it is of the utmost importance that adequate appropriations be made each year to maintain agricultural research work at the necessary level of activity - which must be a high level.

To further assure that this continuing research program is fully integrated with agricultural education and extension, it is proposed that the Director of Agricultural Research located at Guelph should remain directly responsible to the Deputy Minister of Agriculture, as is the present arrangement. The Director of Research, by authority of the Deputy Minister, should be responsible for the co-ordination of research work in the laboratories at Guelph, Ridgetown, Vineland and Kemptville, and shall work directly with the heads of the respective institutions.

Responsibility for direction of graduate studies, which are closely associated with research, should continue to be vested in the Director of Research, except that in respect of this phase of his work he would be responsible to the President of the Federated Institutions. The importance of

co-ordination between graduate studies and the research program cannot be over emphasized. Further, teaching standards in our agricultural and veterinary colleges, in the agricultural schools and short courses, will soon suffer if not re-vitalized at regular intervals by the transfusion of new ideas and information from research workers.

A School of Graduate Studies in a college, to be recognized, must include a well directed and vigorous program of research. Graduate level of instruction cannot be given from textbooks alone. It must stem from knowledge and experience, gained by active participation in research work. By the same token, a well organized and well administered School of Graduate Studies is the heart of the research body in a college or university. Graduate students are "research workers" in training, and they serve as a valuable task-force to direct against the problems of various kinds being studied in the departments.

Research and education advance together - without them our teaching and extension staffs would soon be helpless.

Additional personnel urgently needed to balance the present research staff and graduate studies' instruction at the Ontario Agricultural College include:

- (a) An Animal Geneticist.
- (b) A Specialist in Statistical Design of Research.

The livestock improvement program of the Province must finally resolve itself into a question of genetics. The successful expansion of the Artificial Insemination Program now under way calls for the guidance of an Animal Geneticist, if it is to be of permanent value. Further, graduate studies in animal husbandry need an Animal Geneticist to give the basic science this Department requires for such work. Such an appointment should be at professorial rank.

The design and layout of both laboratory and field investigations has become a specialized task which can be

properly done only by those with special training in mathematics, statistical methods and biometrics. Such a person is lacking on the present staff. For the instruction of all graduate students and the effective planning of most types of research projects in all Departments, there is urgent and immediate need for the appointment of a properly qualified person of professorial rank. An amateur or novice in this field would be worse than none at all. This Committee therefore recommends that:

THERE SHOULD BE APPOINTED TO THE STAFF OF THE ONTARIO AGRICULTURAL COLLEGE RESEARCH SPECIALISTS IN ANIMAL GENETICS AND STATISTICAL DESIGN OF RESEARCH.

These two appointments would constitute an important forward step likely to place the research program in the forefront with the best of the agricultural colleges in Canada.

CHAPTER 16

THE ECONOMICS OF CONSERVATION

Soil erosion and loss of fertility are basically due to man's failure or inability to adapt his use of the land to the physical limitations imposed by nature. An ideal or complete soil conservation program would be one in which the land was used for the exact purpose and in the precise manner dictated by nature. In actual practice, however, this ideal harmony between the use dictated by nature and the use made by man is not always possible. The practical conservation goal to aim at is the maximum degree of this harmony which existing economic and social considerations will permit. In the last analysis, success in conserving resources will be measured by the extent to which these economic and social institutions, attitudes or influences can be brought into line with the unchanging nature of the non-human resources. While this adjustment process involves the solution of many problems that are purely physical, it would seem that the major problems encountered are economic and social in character. All conservation adjustments are bound to effect economic outlay and income and are likely to require at least some alteration in economic and social institutions such as the ones used to hold and administer property, supply credit, enforce taxation or organize and carry on private business. The primary problem of economic analysis is that of providing one of the basis for judging the relative desirability of alternative management practices and uses of soil resources.

CHAPTER 17

EXPLOITATION V. CONSERVATION

Exploitation, maintenance and improvement represent the three types of conditions that may characterize the rate of use of soil resources. While much exploitation results from lack of knowledge or indifference, it is equally true there are many cases where, in spite of the necessary knowledge and greatest desire to conserve, exploitation occurs because of the existence of some form of economic pressure. This may take any one of many forms. For example a farmer's property may be too small to provide an economic operating unit under best land use practices; or, being heavily in debt, he may be forced to seek extra income by exploiting his farm during periods of high prices. On the other hand, because of a large amount of fixed costs, he may not be able to afford proper soil conservational practices during a low-priced depression period; or, it may be that he is unable to get sufficient of the right kind of credit to permit good soil conservation; moreover, his rental contract may not provide any economic inducement to conserve rather than exploit. These or various other forms of economic pressure may prevent this farmer from farming as he knows he should in order to conserve his soil.

It has been submitted that an exploitation form of agriculture is more profitable than one of conservation. This statement needs qualifying. Exploitation in agriculture leads to diminishing returns over a period of years, and cannot be compared with a sustained yield agriculture where the returns tend to be maintained or increased over a period of years.

There are probably two sets of circumstances which invite exploitation in agriculture. One is the situation where the probable prices of cash crops are relatively much higher than those of livestock and livestock products. Generally speaking, conservation farming involves increasing emphasis on livestock. The other situation exists whenever

land is cheap compared with labour and the many forms of capital. It has always been considered good economics to use most carefully those things which are relatively dear and be less particular about saving or conserving those which are relatively abundant and therefore cheap. If, in the course of time, the demand for and therefore the price of farmland in Ontario increases, there will be a corresponding increase in interest in the subject of soil conservation. It is not without significance that some of the most active interest in soil conservation exists in areas where farmland values have risen most. An example of this increased interest in soil conservation, where land is relatively scarce, is in the County of Essex. Here a county soil conservation program has been inaugurated and a technically trained soils man has been employed to promote and direct this program.

CHAPTER 18

PUBLIC INVESTMENT FOR SOIL CONSERVATION

It is clearly in the public interest to achieve conservation farming on the basis that soil resources are being more wisely utilized and consideration is made for future requirements of the people. Often the adoption of such conservation farming practices reduces current income during the transition from an exploitative agriculture and it is evident that some kind of a transition bridge is needed before there will be a change from such a basis to a system that maintains or improves soil resources.

This bridge could be built with public investment through a greatly accelerated program of a farm planning and agricultural extension service as outlined in this section of the report on Soil. Once the transition has been accomplished it would pay out from both the public and private point of view.

CHAPTER 19

YOUTH AND THE LAND

Over a period of some years, private capital has gradually withdrawn from the field of agricultural loans. The need for this type of credit has of consequence been increasingly supplied by both Federal and Provincial Governments. In Ontario, farmers were able for many years to secure credit from the Ontario initiated and operated Agricultural Development Board. This Board ceased its loaning operations when the Dominion Government started loaning money under the Federal Farm Loan Board.

This means of securing agricultural credit has gone a long way toward meeting the need, but it is now apparent that there is one glaring inadequacy, namely that a young farmer with little capital cannot meet the requirements of the Federal Farm Loan Board and consequently is unable to commence farming and invariably drifts to the larger centres of population. This drift of the farm youth to the city was stated with emphasis at many hearings before this Committee. There are basic reasons why some loaning agency should meet this need.

The young man to start farming today must do so in a mechanical age - to start in any other way places him in a dangerously handicapped position, producing as he must, in competition with the lower production costs of the larger mechanized unit. Many highly capable young men unable to obtain the necessary financial backing go to the cities and are lost to the agricultural industry. The industry and the nation as a whole cannot afford to lose this type of young man in increasing numbers.

In a brief presented by the Junior Farmers Association of Ontario, it was recommended that the Ontario Legislature look into the possibilities of providing a similar type of assistance as the Veterans Land Act, for young men who have

proven experience on Ontario farms and are seeking to purchase farms of their own. As a follow up to this recommendation, the Committee suggested that the Junior Farmers Association conduct a survey in different sections of the Province to ascertain how many young men would take advantage of such a scheme if one was set up, and to find out what percentage of the total capital involved in starting farming should be loaned to them. The survey was conducted through Junior Farmers Clubs in the nine Counties of Dundas, Lanark, Hastings, Simcoe, Bruce, Kent, Oxford, Lincoln and Halton. The following is the summary of this survey in which 300 questionnaires were submitted:

1. Q: Are you planning to operate a farm?

A: 92 per cent answered "yes".

2. Q: If "yes", do you have all needed funds?

A: 78 per cent required additional capital.

3. Q: Would you use a financing plan, such as V.L.A., if available to you?

A: 79 per cent were in favour of a financing plan.

4. Q: For the type of farm you plan to operate in your district, what capital would you need for (a) land and buildings, (b) livestock, (c) machinery and equipment and (d) household goods?

A: This varied considerably by areas and the local types of farming which prevail, but for those who stated their requirements to start farming the averages were:

(a) Land and Buildings	\$ 9,486
(b) Livestock	1,856
(c) Machinery and Equipment	2,428
(d) Household Goods	<u>633</u>
Total	\$14,403
(e) Average Capital Available	\$ 4,692

This involves a credit of approximately \$10,000 which is more than present lending agencies will advance to establish young farmers.

The Ontario Agricultural Commission of Inquiry of

1945 recognized this problem and recommended: "That special provision be made by the Province of Ontario to assist young experienced farmers to establish themselves on farms, in cases where such young persons had a smaller amount of capital to contribute than is considered desirable under orthodox lending practices. This could be accomplished by the Government assuming part of the risk of the excess loan involved, by arrangement with institutional lenders, with the Federal Farm Loan Board, or with other appropriate private lenders willing to co-operate in a scheme that would embrace a selective system of qualification for such loans and some appropriate exercise of supervision over the borrower's financial and farm operational practices until the loan is at a level at which the material security would cover the risk, judged by traditional standards".

This Committee feels that if agriculture in this Province is to advance it must give increasing attention to conservation practices and the leaders in this crusade for better agriculture must come in the main from the young men now on our farms. We must make it possible to retain a higher proportion of these alert and qualified young men in the agricultural industry by advancing a portion of the capital to finance their establishment on farms of their own. This Committee recommends that:

THE GOVERNMENT OF THE PROVINCE OF ONTARIO SHOULD
RECOGNIZE THE RESPONSIBILITY OF PROVIDING LONG
TERM CREDIT THROUGH SOME AGENCY TO MEET THIS
PROBLEM OF ASSISTING YOUNG EXPERIENCED FARMERS
TO ESTABLISH THEMSELVES ON FARMS.

SETTLEMENT IN NORTHERN ONTARIO

Following the agricultural settlement of Southern Ontario, an attempt has been made to fashion farm lands in the north after the patterns established in the south. This could succeed only if the environments were similar.

It is true that at first the soils of the Haliburton and Muskoka uplands may have appeared as rich as those of Southern Ontario but it should not have taken long to discover that settlement in these areas is dependent not on clearing the land but on management of the forest.

Similarly in the northern clay belts the presence of dark coloured organic matter signified good soil even to experienced farmers from Southern Ontario. That this peat indicates a retarded soil development was perhaps unbelievable. Without a classification of land and a land policy, a program planned ostensibly to develop the agricultural potentialities of the region was destined to degenerate into an implement of deforestation.

For years settlers were free to settle where they liked with few restrictions. The forests were to take care of that day's needs; the lands were to be developed for tomorrow's sustenance. The settlers faced two main alternatives. First they could choose the better drained locations. These were scattered, hard to reach, and usually burnt over. To choose them meant long years of hard work to make a farm and a lifetime of waiting for schools and roads. Secondly, they could choose a lot which, though it would obviously never make a farm, had a good stand of spruce which would provide a living while it lasted.

Most of the settlers who chose the first alternative failed largely through no fault of their own. The settlers who chose the second can hardly be blamed any more than a government offering for sale land which by individual effort



A Prosperous farm in Northern Ontario.



High costs of clearing and development have created many abandoned farms in the northern clay belts.

cannot be economically developed.

One of the first obstacles to be surmounted in developing the clay belt lands for agriculture is that of providing adequate drainage. This should not and cannot be done efficiently on an individual basis but requires the combined effort of a group of settlers in a drainage area, assisted by a municipality, if any, and the Province. Similarly, to clear and break land efficiently requires certain heavy machinery which is too costly for scattered individual settlements. Heavy clearing and breaking machinery can be effectively employed only within agricultural communities. The lack of a plan to settle the northern clay belt on a consolidated community basis has been the root of many of its present ills. Many a settler took out a patent where the nearest neighbor was miles away. Such a life was fraught with loneliness and despair, often resulting in abandonment. To some extent this has been overcome by the present policy of granting settlement locations only if within one mile of a public road and three miles of a school. Notwithstanding the present regulations, the dispersion of settlement is still excessive. It is unsound to open for settlement further lands where there are no public utilities available, while there are still many thousands of acres of developed highly potential agricultural land, serviced with costly public utilities - roads, schools and hydro - within a few miles of the towns and villages. The difficulties imposed by nature on the development of virgin soil in the clay belt to a productive state of tilth and fertility, demand that its settlement be on a community basis and not with the individual frustrations that have occurred in the past. This need for community development in Northern Ontario is of vital importance to a successful settlement program.

An example of this need for consolidated settlement can be illustrated by two examples: One is the township of Glackmeyer near Cochrane; the other, near Emo, Alberton and Chapple, in the Rainy River clay plain.

Glackmeyer Township, in which the Town of Cochrane is located, contains 336 lots of approximately 150 acres each. Most of the land in this township has a moderately low cost of development with a fairly high agricultural potential for Northern Ontario, and it could certainly be rated as a better than average township for agricultural development in the Cochrane Clay Belt. The township has good gravelled roads, sufficient schools to serve every concession, and high school facilities at Cochrane. There are two cheese factories with a creamery and dairy in the town. Hydro is available to 158 of the 336 lots, or 47 per cent of the area.

A survey of the township in 1949 reveals the following conditions:

96 lots are occupied and not all by full-time farmers.

52 lots have been patented and are now for sale.

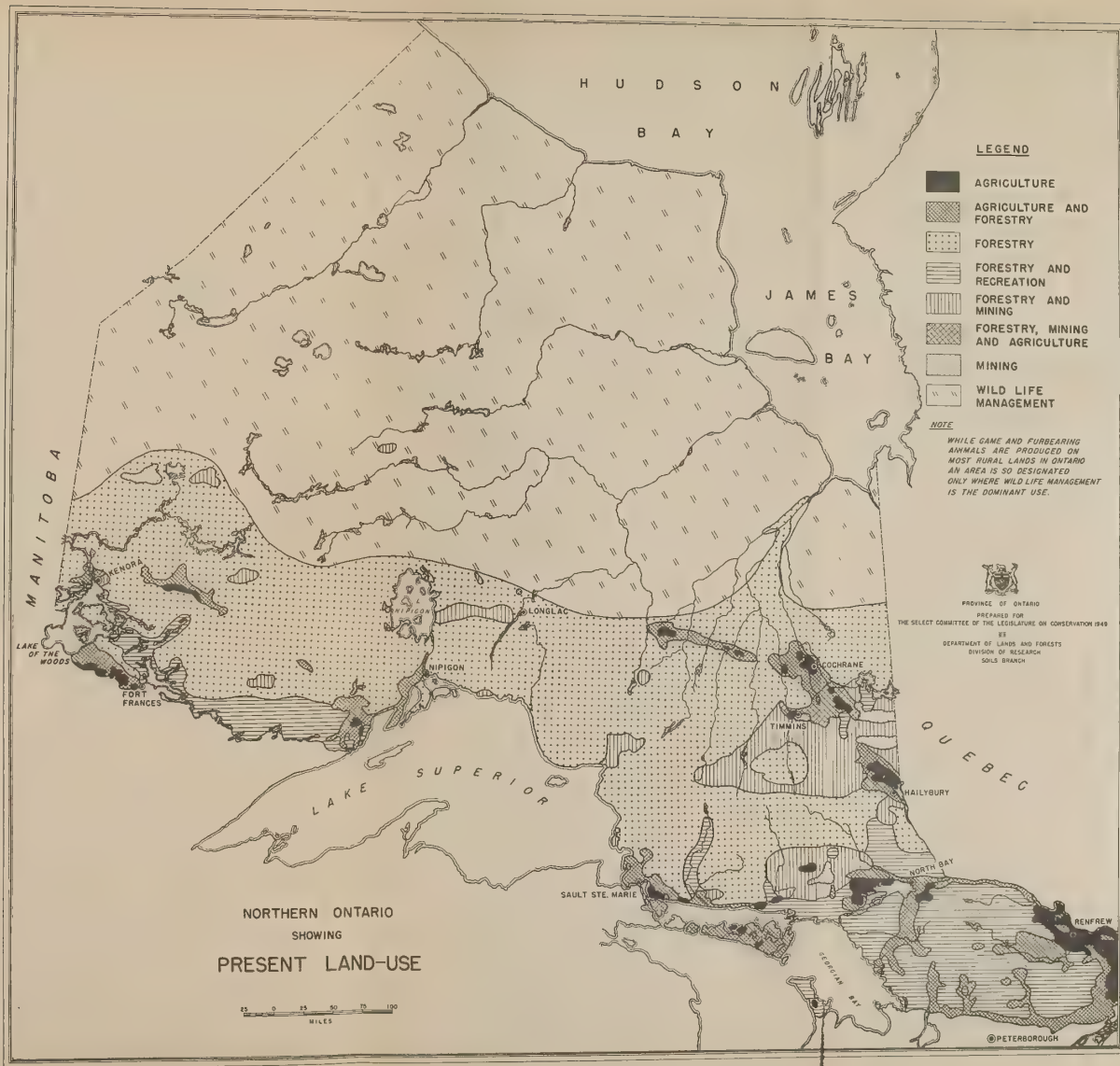
76 lots are still unpatented, most of which are for sale.

112 lots are in the name of the Crown.

With such a township so favourably located for markets, transportation, public utilities, and with a high percentage of the land suitable for agricultural development, it is surely not in the interest of the settler nor of the Province to open up other lands much less favourable for settlement.

Evidence was submitted to the effect that in the Emo, Alberton and Chapple districts of the Rainy River Clay Plain, there are approximately 13,000 acres of agricultural land that have been developed and are available for immediate settlement, with an additional 10,000 acres of agricultural land requiring some development prior to settlement. These districts are served by roads, schools and in most cases, hydro. There are favourable markets for livestock and farm produce. Here too, consolidated settlements are of vital importance not only to the economy of the district but for the morale of its people.

One of the major problems of the north originated in the practice of granting settlement locations with little or



no regard to the inherent capabilities of the soil. As in any region of Southern Ontario, not all lands within the clay belts have the same agricultural capabilities. There are enough handicaps and hazards for the northern farmer, such as transportation costs, markets and climate, without adding still another, that of locating him on land of a lower agricultural capability. This Committee recommends that:

NO NEW TOWNSHIP OR AREA IN NORTHERN ONTARIO
SHOULD BE OPENED FOR AGRICULTURAL SETTLEMENT UNTIL
A BASIC LAND USE SURVEY HAS BEEN MADE WITH FAVOURABLE
FINDINGS.

Such an inventory usually indicates not one but several alternative uses to which an area may be put, and economic factors will eventually determine the rate and pattern of development. Much hardship and confusion can be averted if planning at various governmental levels takes into account not only the order of development of each settlement area but the type and intensity of such development.

It is suggested that before the decision is made as to what township or area should be opened up for settlement that a basic land use survey should be made by a Provincial Inter-departmental Committee in consultation with a Regional Advisory Board from each region of settlement. The transition from forestry to agriculture can be relatively quick, but it will require at least 60 years to return an area to a forest economy once it has been cleared for agricultural settlement. Mistakes in agricultural settlement are very costly, not only to the individual but to the entire economy of the Province.

There are many well developed agricultural lands in the north, against which liens were registered under the Northern Development Act. The Act itself is largely a dead letter except with respect to the liens. In some cases the settler who incurred the lien has long since moved away, and the interest charges are often more than the original debt. The fact is that the loans (namely, for seed grain, feed



After clearing the black spruce forest, part of the deep sphagnum peat and the stumps must be bulldozed into windrows, prior to burning.

shortage 1922, feed shortage 1933, cattle purchase, agricultural implements and settlers' advances under the Northern Development Act or its predecessors) are mostly not collectable. They should be finally extinguished. The liens are an impediment to the re-settlement of the lands. It is recommended that:

ALL OUTSTANDING INDEBTEDNESS FOR SEED GRAIN, FEED SHORTAGE 1922, FEED SHORTAGE 1933, CATTLE PURCHASE, AGRICULTURAL IMPLEMENTS AND SETTLERS' ADVANCES MADE UNDER THE NORTHERN DEVELOPMENT ACT OR ANY PREDECESSOR TO THAT ACT SHOULD BE WRITTEN OFF AND DISCHARGED. THE NORTHERN DEVELOPMENT ACT SHOULD BE REPEALED AND ANY LANDS VESTED IN THE SETTLERS' LOAN COMMISSION SHOULD BE TRANSFERRED TO THE COMMISSIONER OF AGRICULTURAL LOANS FOR DISPOSITION.

The opening of any settlement area in the northern clay belts must initially be on the basis of a combined husbandry of field and forest. This combined economy should gradually give way to one of primary agriculture in which forests continue to give balance to land use. Recognizing the value of forests within an agricultural community, and its contribution to the overall economy, provision should be made when opening new townships or areas for settlement to set aside a percentage of the area for community forests. It is therefore recommended that:

IN OPENING NORTHERN ONTARIO FOR SETTLEMENT A PERCENTAGE OF THE AREA SHOULD BE SET ASIDE AS COMMUNITY FORESTS WITHIN WHICH LOCAL SETTLERS MAY ON APPLICATION BE GRANTED CUTTING PERMITS.

Prior to 1918 there were approximately 10,000 mining patents granted by the Province on 400,000 acres which included title not only to subsurface rights but also the surface rights, excepting pine. Subsequent to 1918 subsurface rights only were granted. It appears that some of these properties

are located in or adjacent to agricultural communities, and that they have a considerable acreage of agricultural land. Where such is the case, it is a decided deterrent to settlement. On other properties the surface rights controlled under patents issued prior to 1918 are suitable only for forest crops, and it is alleged that in many cases these are being badly cut over without consideration for a future crop of wood. This Committee believes that all mining rights granted prior to 1918 should be placed on the same basis as those issued subsequently, under which subsurface rights only were granted. It is recommended that:

CONSIDERATION SHOULD BE GIVEN TO THE RECOVERY BY
THE CROWN OF SURFACE RIGHTS GRANTED PRIOR TO 1918
FOR MINING PURPOSES.

WATER

CHAPTER 21

FLOOD CONTROL

Floods in Southern Ontario are not new. Caused by natural overflow or run-off from river basins, they have been happening ever since records were first kept. They are mentioned in diaries of the 18th Century and in newspapers for at least 100 years past.

Most of the overflow and run-off occurs in the spring, so that there is then too much water at the time it is least needed, and not enough later in midsummer when it is needed most.

Floods also occur during the summer on watersheds having inadequate natural protection. Both spring and summer floods have caused heavy damage, and not only along the larger rivers. Records show that almost all rivers, and many creeks, large and small, have caused flood losses from time to time.

The fact that floods occurred when Southern Ontario was heavily wooded suggests they are not entirely man-made. Natural drainage was not enough to take care of excessive run-off due to sudden spring thaws. However, there is no doubt that flooding has been aggravated by deforestation, silting and other man-made conditions.

The evidence presented to this Committee clearly establishes that there is no single easy solution for the flood problem. Flooding can be controlled, restrained and minimized by a series of measures along a broad front. All measures which increase water-holding capacity and slow down run-off tend to maintain better sustained flow, which of course means a higher minimum and a lower maximum.

The grass waterway, the hillside permanently in sod, the contoured furrow, the small woodlot and the large forest, the farm pond and the village mill-pond, natural and artificial



The Grand River at Galt during the 1948 spring flood

(Courtesy Toronto Daily Star)

We have floods in spring and drought in summer, too much water when we do not especially want it and not enough when it would be more useful

The Grand River at Galt in summer



lakes and reservoirs of every kind, dams and dredged channels - all these have a part to play in flood control, because all tend to decelerate run-off, permitting snow and rain water to be absorbed into the ground, there to feed crop or renew ground-water supplies.

The problem is a formidable one. It would be difficult to estimate the economic loss when thousands of acres of cropland are regularly inundated by the South Nation River, or when many blocks of London and Chatham are under five feet of water from the Thames. It is believed that Brampton's property loss from a single flood of the small Etobicoke Creek in 1947 was at least \$500,000.

Without giving a complete list, the most persistent offenders are the South Nation; the Moira at Belleville; the Ganaraska at Port Hope; Duffin's Creek at No. 2 Highway; the Etobicoke at Long Branch and Brampton; the Saugeen at Walkerton; the Grand at Galt, Paris, Brantford and Dunnville; the Thames at Woodstock, Ingersoll, Mitchell, St. Mary's, London, Thamesville and Chatham; the Ausable at Port Franks; the Sydenham at Dresden; and the Maitland at Goderich.

Not all flood damage should be attributed to the offending river. Many of our cities and towns have encroached upon the original flood plains. These low-lying lands were frequently flooded when the entire watershed was wooded and were built by the alluvium from the flood waters themselves. They should never have been used for building purposes.

The Municipal Act, Section 406, now makes it possible for a municipality to prohibit the use of low-lying flood plains for residential or industrial purposes. Evidence before this Committee suggests that the provisions of Section 406 are not clear or not known to many municipalities.

Land use is an important factor in determining the volume and speed of run-off.

The first objective of flood prevention and water

conservation must be to restrain and control the water where it falls on the land, absorbing as much as possible into and below the ground where the need is greatest and where the sources of sustained flow can be stabilized. When Ontario was mostly covered with forest and the natural reservoirs, such as large swamps, had not been interfered with, the volume and speed of run-off was undoubtedly less than today. Falling rain water sank gently to the sponge-like forest floor and then slowly below. Moreover, river channels tended to be clearer and deeper when little or no topsoil was washed down to become silt.

Land clearing and drainage necessarily accompanied settlement, but in some cases both were carried beyond the point of necessity, thereby aggravating the flood problem. This is something to be kept in mind whenever it is proposed to clear or drain land for agricultural purposes without first ascertaining whether such land is actually suitable for agriculture.

There is every justification for clearing and draining land if its productive potentialities are high. As explained elsewhere in this report, areas of this kind are still to be found in Southern Ontario. On the other hand, marginal or submarginal lands which were never suitable for cultivation, should be returned to forest or their natural conditions so that they may again serve as storage places for water.

The role of the forest in conserving water has been widely publicized. Not so well known is the amazing power of grass to hold water and protect the entire countryside against both soil erosion and excessive run-off. Much of our best agricultural land as well as most of our cities and towns lie in the river valleys of Southern Ontario. Here grass probably has a more important part to play than reforestation. Grass is the great defender of farmlands, constantly battling to protect them against the loss of precious topsoil and water.

This is particularly true on hilly or sloping fields, or wherever rainstorms tend to make watercourses into ugly gullies.

Here are the results of an experiment on typical Ontario land at the Central Experimental Farms, Ottawa, showing the water loss under different crops from a 10 per cent slope:

Crop	Water Loss Per Acre
Corn	289 Tons
Oats	58 Tons
Alfalfa	28 Tons

It will be seen that over 10 times more water escapes from the corn field than from the alfalfa field - with a slope of only 10 per cent. Ironically enough, corn is a very thirsty crop and can ill afford to lose that water which runs away so quickly.

Not only crops but methods of cultivation also provide startling contrasts. Following is the result of a three-year experiment conducted by the United States Soil Conservation Service on Iowa silt loam with a slope of only eight per cent ¹.

Crop	Water Loss, Per Cent Precipitation
Corn Cultivated on the Contour	0.1
Corn Cultivated up and down Slope	10.3

These experiments very clearly show the effect of crop and tillage practices on the speed and volume of water run-off. These two examples in particular show why strip-

1. Bennett: Soil Conservation, p. 161.

cropping can be so valuable both to the farmer who suffers from summer drought and the valley resident who suffers from floods. Alternating strips of grass and corn cultivated on the contour obviously will slow down the escape of water.

Other examples could be cited. Run-off is influenced by the texture of the soil. Water leaves hard cement-like soil as it would leave pavement - quickly. Good soil, rich in organic matter, tends to absorb water. Thus the application of barnyard manure or the ploughing in of green manure tend to prevent excessive run-off. Almost every agricultural practice has its bearing on water control. This is even more true in our climate than it would be in Britain or in Europe. There rainfall is gentler and spread through most of the year. Here we experience extremes of temperature, sudden thaws, violent thunderstorms with heavy destructive raindrops, and long periods of hot, dry weather. These phenomena make water control not a luxury but a necessity for us.

Water control must begin with a program of proper land use. Such a program requires the co-operation of a great many individuals over a period of years. This is a program which cannot succeed overnight. The first essential is to persuade every landholder that both his individual advantage and the public good call for such a program. It is a fundamental recommendation of this Committee that:

TO REDUCE EXCESSIVE WATER RUN-OFF, WHICH AGGRAVATES THE FLOODING OF RIVER VALLEYS, LAND USE PRACTICES TENDING TO SOIL WASTAGE, SOIL DEPLETION AND SOIL EROSION MUST BE DISCOURAGED AND DISCONTINUED, AND THE FARM PLANNING PROGRAM SET OUT IN THE CHAPTER ON SOILS IN THIS REPORT MUST BE ADOPTED AND IMPLEMENTED.

It is still true of course that reforestation, particularly in strategic areas, has a large part to play in the



It is difficult to estimate the loss caused by flood damage in the Province

Agricultural lands are often inundated by flood waters



regulation of water. It would be a mistake, however, to regard it as a cure-all for the prevention of floods. The headwaters of certain rivers, where such work must be done to be effective, include good agricultural land and cannot entirely be returned to forest. Moreover, apart from the cost, the effect of planting would not be felt for many years. It is recommended that:

THE PROGRAM OF RESTORING TREE COVER TO THE NON-ARABLE LANDS OF ONTARIO, REFERRED TO IN THE CHAPTER OF THIS REPORT ON FORESTRY, SHOULD BE IMPLEMENTED AS AN AID TO THE STABILIZATION OF RUN-OFF, SUMMER FLOW AND GROUND-WATER SUPPLY.

To control and conserve water effectively in Ontario, it is necessary to know more about the natural supply, and the behaviour of our drainage systems. This is particularly true when a heavy investment in dams is proposed.

One of the first problems facing the hydraulic engineer is to estimate or measure the run-off from a drainage basin, which in turn causes flooding farther down the valley. This includes a careful examination of rainfall over the years at different times of the year, which in turn presupposes that weather stations have been established in the area. Topography, types of soil, the amount of vegetative cover - particularly tree growth - and the gradient of the river, which has a bearing on the rapidity with which the water travels to the river's mouth, must all be carefully studied. If no gauging stations have been established then the run-off must be estimated by taking the above factors into consideration. An approximate figure of flow can also be determined by comparison with a neighbouring drainage basin which has gauge records. If, on the other hand, gauges have been established by which a daily record is kept of the amount of water going down the channel at certain points, then a more accurate appraisal can be made of

how much protection in the form of reservoirs is needed.

Unfortunately, in Southern Ontario, only those rivers which have power possibilities have a record of gauging for many years, and it is only within the last four or five years that gauging stations have been set up to record the flow on the smaller ones. This lack of stream measurement makes the work of hydraulic engineering in Southern Ontario extremely difficult. It is therefore recommended that:

IN CO-OPERATION WITH THE APPROPRIATE DEPARTMENT OF THE ONTARIO GOVERNMENT, ALL RIVER GAUGING STATIONS SHOULD BE BROUGHT UNDER THE DIRECT SUPERVISION OF THE DOMINION WATER AND POWER BUREAU AND THE FEDERAL GOVERNMENT SHOULD BE URGED TO EXPAND THEIR HYDROLOGIC STUDIES ON RIVERS THROUGHOUT ONTARIO.

After the amount of run-off has been measured by whichever means are available to the engineer, it will give him a figure of flow which will indicate how much of this water will have to be held back by different methods in order to give the necessary protection where flooding is taking place. This means that a reconnaissance survey of the whole watershed must be made in order to select suitable valleys where dams can be built. When more than a sufficient number of such reservoir sites have been selected, each must be measured as to its capacity, and the required number chosen to hold back sufficient water to solve the flood problem. In addition, wherever a reservoir is to be built, some exploratory work must be done at the damsite to make sure that the bedrock is sufficiently close to the surface and of the proper quality, so that the proposed dam will have an adequate foundation. Only after this preliminary work has been carried out can the reservoirs be chosen, the dam structures designed and the work carried through to completion.

While conservation reservoirs are usually built for the purpose of preventing floods, they are needed just as much in Southern Ontario for increased summer flow. This has become increasingly important in recent years because rivers with extreme low flow and those which dry up entirely are a health menace to the communities through which they pass. Summer flow is necessary for flushing out the channels, to furnish water for industrial and domestic purposes and for the practice of good agriculture. It is absolutely necessary for dilution where urban municipalities empty the effluent of their sewage disposal plants or raw sewage into the river, as is frequently the case.

The construction of these large flood control reservoirs is costly, often more than the directly benefitting municipalities can afford. When flood waters from Ontario rivers do serious damage to urban and rural areas, such loss is definitely of national concern and the areas so effected should not be held entirely responsible for financing remedial measures. This should be the joint responsibility of the municipalities concerned, the Provincial Government and the Government of Canada.

Evidently this was realized when the Shand Dam was constructed. whereby the directly benefitting municipalities paid 25 per cent of the cost, the Provincial Government 37½ per cent and the Federal Government 37½ per cent. Already the Federal Government is in a land rehabilitation and flood control program through its Prairie Farm Rehabilitation Act. It is understood that this Federal participation through the P.F.R.A. developed by reason of an acute emergency situation - the prairie drought and dust-storms of a decade or more ago. It seems reasonable that although such an emergency is not as spectacularly disastrous here in Ontario as in the Prairie Provinces, there would be sound justification for the Federal Government to assist in the prevention of heavy losses, perhaps

less spectacular but no less serious, through an integrated flood control program effecting all Provinces of the Dominion. This Committee recommends that:

WHERE THE CONSTRUCTION OF LARGE RESERVOIRS IS AN INTEGRAL PART OF FLOOD CONTROL, THESE SHOULD BE FINANCED JOINTLY BY DOMINION, PROVINCIAL AND MUNICIPAL GOVERNMENTS, THROUGH ORGANIZED CONSERVATION AUTHORITIES.

The building of large dams for the prevention of floods and the maintenance of summer flow is a comparatively new concept in our engineering, although it was successfully done in Western China over 1,500 years ago. It is only in recent years that structures of this kind have been undertaken in North America. The older methods include such projects as straightening and widening the river channel, removing obstructions like islands, narrow bridges and other man-made works which obstruct the flow or cause ice jams. Also occasionally a river was diverted into another watershed, or dikes were built to hold it within its banks. Such practices are aimed at one thing only, namely to get rid of water as quickly as possible. They do not take into consideration the necessity of holding water at the headwaters for deep infiltration or retaining it for summer flow throughout the year.

On some rivers in Ontario channel improvements, diversions and even dikes must be built, especially where the topography does not lend itself to reservoirs and summer flow is not a major problem. Evidence presented at Chatham indicated that flooding was intensified on the lower reaches of the Thames by reason of ice jams at the mouth of the river. It would appear that the judicious use of tugs or ice-breakers to clear this ice and hence lower the flood crest would be of considerable value. It is recommended that:

IMMEDIATE STUDY SHOULD BE MADE OF THE PRAC-
TICABILITY OF EMPLOYING TUGS, OR ICE-BREAKERS,
FOR OPENING RIVER CHANNELS TO PREVENT SPRING
FLOODING.

CHAPTER 22

MUNICIPAL WATER SUPPLY

"All life depends on water". As Ontario grows in population, agriculture and industry, the truth of this axiom becomes more than ever apparent.

Pure fresh water is looked upon by most men as an inalienable right. The evidence presented to this Committee conclusively indicates that Southern Ontario has already reached a stage in its development where all information concerning water resources should be brought together and evaluated. Definite plans must be made to sustain an increased population. Many of the older settled areas of the world, - Britain, France, Germany and Scandinavia - passed through this stage of development 75 to 100 years ago. They saw the handwriting on the wall which pointed to diminishing potable water supplies. They laid plans and took action to assure an adequate amount of water for domestic and industrial purposes in their era of expansion. This Province must now face the same problem.

In Ontario there are now 354 municipalities with public waterworks systems, including those which have their own source of supply and those which obtain water from other communities. Analysis of these municipal systems show that the sources of supply are as follows:

Wells	-	110
Lakes	-	98
Springs	-	40
Rivers	-	116

South-western Ontario is a peninsula, surrounded by water on all but the north-east side. This means that its watersheds are relatively small. Except for lakeshore communities the supply of surface water is, and always will be, limited. There are no great plateaus or mountain ranges from which to draw a heavy flow. Water conservation is, therefore,

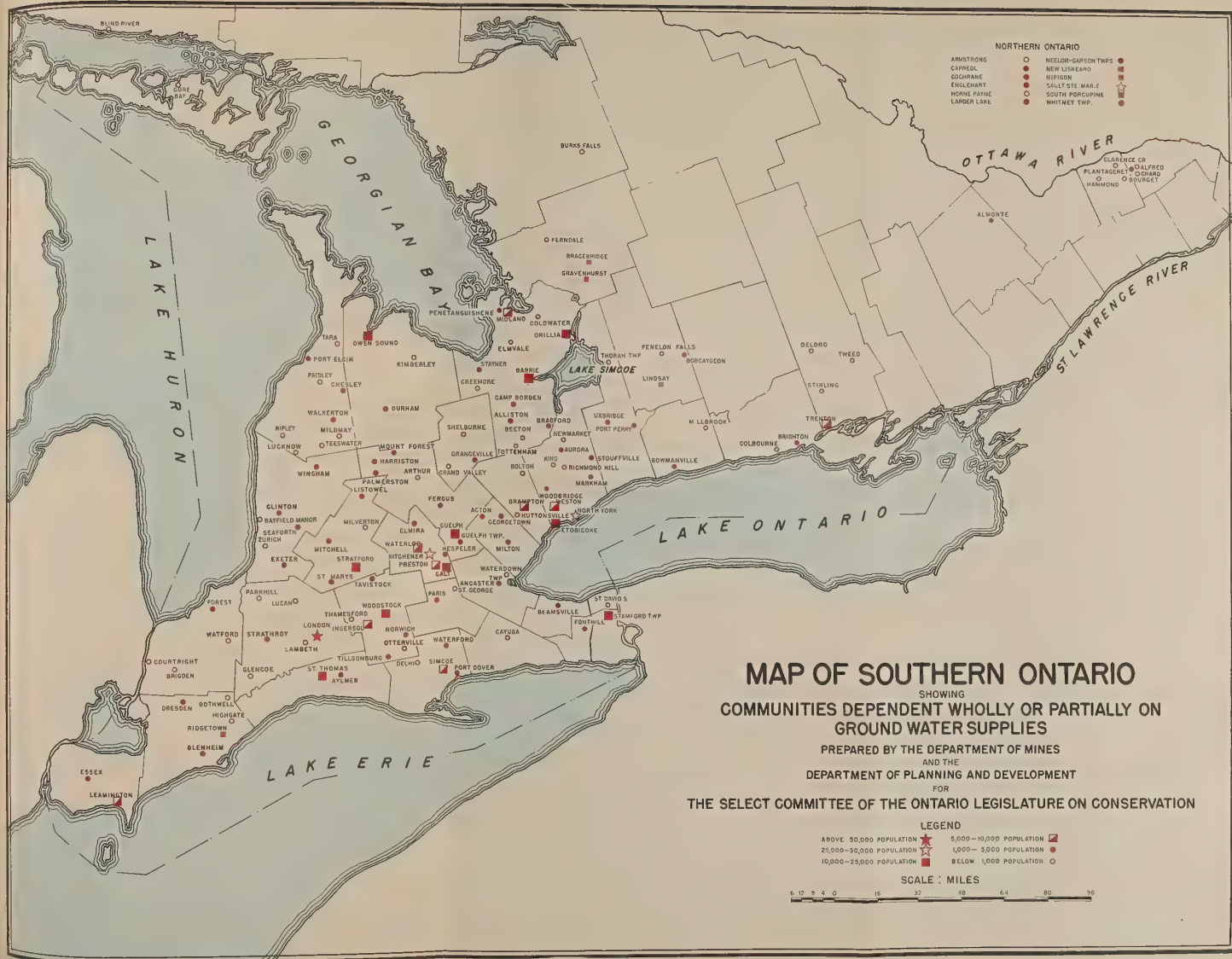
absolutely essential to the well-being of inland cities and towns, while ground-water supply assumes for them extraordinary importance.

Two million people, or almost one-half of our total population of four and one-half millions, are dependent upon subsurface water supplies. As shown on the accompanying map, these include the larger Cities of London, Chatham, Guelph, St. Thomas, Owen Sound, Woodstock, Stratford, Kitchener, Brantford and Galt - cities whose sole limiting factor now for industrial and population expansion is water supply. They also include scores of towns and villages. The Province is clearly a large user of ground water. The continuous replenishment of these subsurface water resources accordingly becomes a most important necessity. It is vital both for rural areas that depend on shallow wells of limited capacity and the urban communities that need large quantities.

Several studies have been made of specific areas in Ontario with relation to ground water which indicate that the headwaters of streams, former springs and water storage areas, such as swamps, have either receded or dried up entirely. Evidence presented to this Committee, particularly from Western and South-central Ontario, has been most emphatic on the apparent lowering of ground-water supplies. Not only do farmers complain that their wells are going dry, but many of the large cities mentioned above are finding it difficult to secure water for an increasing population, or even their present numbers.

This growing demand by our large inland cities has caused serious difficulty for farmers adjacent to deep urban wells, which deprive the shallower farm wells of much water.

It is the view of this Committee that we cannot permit the continued drilling of new wells without regard for the effect on other wells or the disturbance of reservoirs about which so little is known. Steps must be taken to protect the prior users, recognizing at the same time that ground-water



resources are not the monopoly of any individual or group but are to be carefully and economically shared. This Committee recommends that:

LEGISLATION SHOULD BE ENACTED WHICH WOULD REGULATE THE GROUND-WATER SUPPLY OF URBAN AND INDUSTRIAL USERS WITH A VIEW TO PROTECTING PRIOR RIGHTS OF RESIDENTS OF OTHER MUNICIPALITIES AFFECTED, AND AT THE SAME TIME PROVIDING FOR AN EQUITABLE DISTRIBUTION OF SUCH GROUND WATER TO ALL CLAIMANTS.

The problem of failing ground-water supplies undoubtedly goes back to the clearing of land and the draining of large water storage areas which in the past have recharged the soil with snow water and periodic rains. Some of these former upland swamps so drained are now of great agricultural value and it is in the interest of the people of Ontario that they be cultivated. Unfortunately, some of the swamp areas, notably the Luther Marsh at the sources of the Grand River, have been drained with no resultant increase in agricultural value, yet causing a lower ground-water level. This bears testimony to the need for more careful soil and land use surveys and analyses.

To increase the ground-water supply, there is again no easy solution. Reforestation, the reclaiming of certain swamps for their original purpose and proper land use are all important. Also necessary are the construction of storage reservoirs at strategic points in the river valleys which would serve the dual purpose of assisting flood control and recharging the soil beneath the impoundment, especially if the subsoil is gravelly or absorbent. This process of recharging the underground water supply, or water spreading, as it is sometimes called, has become so essential in some parts of the United States, particularly on Long Island in New York State,

that the water taken from the ground there is metered, and in many instances must be returned by infiltration, through deep wells and open reservoirs, into the aquifer whence it came. To make the best use of reservoirs, we need more geological surveys to determine the size and location of gravelly or absorbent beds in which water may be stored.

The replenishment of underground water is, therefore, a major consideration. It is vital both for the rural areas that depend on shallow wells of limited capacity and the urban communities that require large quantities. If rain and snow water continue to race away at top speed into the rivers and lakes rather than percolate into the ground, the day is coming when Ontario inland cities will be forced to build vast and costly works, piping water from the Great Lakes, or construct equally costly dams to contain enormous reservoirs.

The first concerted study of ground-water resources in Southern Ontario was carried out in 1945 when the Conservation Branch of the Department of Planning and Development engaged a specialist to make a general survey. The result is an unpublished report on file with the Department. However, as this work requires trained geologists, it was transferred to the Department of Mines. The ground-water program now being carried on by that Department is as follows:

(a) Licencing of Water Well Drillers and Submission of Records

Legislation has been enacted requiring each water well driller to have a licence. The driller must submit a Record containing pertinent data on each well drilled, which will eventually build up a useful fund of knowledge concerning ground-water conditions throughout the Province - a slow process.

(b) Detailed Water Surveys

A detailed survey of ground-water resources is carried on in a number of townships each year, to determine the availability of ground water and to indicate those areas

where the supply is greater. The Federal Government also has several ground-water survey parties operating in Ontario each year.

(c) Observation Well Program

Forty wells in Ontario are under observation with respect to the water table fluctuations. Some are in rural areas but most are located in municipalities where water is obtained from underground sources. These wells have been observed since 1946 but even these, although showing seasonal and annual fluctuations, must remain under observation for several years yet to permit even the least cautious comment on the trend of ground-water levels.

(d) Reports

The Department of Mines plans to publish annual reports listing logs and other data on wells, together with observation well measurements. A separate report will be published for each township on which a detailed water survey has been made. This is useful work, but many years will pass at the present rate before it will cover even those municipalities where the ground-water problem is paramount. Many submissions from both rural and urban sources to this Committee have urged more definite and immediate information on the subject. All levels of Government share a responsibility in solving the problem, and it is the opinion of the Committee that not sufficient use has been made of our universities to assist in this work.

This Committee recommends that:

THE GOVERNMENT SHOULD ARRANGE A CONFERENCE OF
THE INTERESTED AGENCIES - FEDERAL, PROVINCIAL,
MUNICIPAL AND EDUCATIONAL INSTITUTIONS - WITH
A VIEW TO ACCELERATING GROUND-WATER STUDIES AND
FORMULATING SPECIFIC RECOMMENDATIONS FOR ACTION.

Ontario is now experiencing a vast industrial expansion. It is limited, however, by the uncertainty of supply.

An example of rapid expansion is that taking place in the Grand River Valley. Most of the industrial communities on the Grand are entirely dependent on ground water. It is no longer adequate. Further rapid expansion would soon necessitate bringing water from long distances. The one thing certain about such projects is that they would be costly.

It has been forecast that it may become necessary to pipe water from Lake Huron or Lake Erie, through a grid system, to supply most of the growing industrial cities of South-western Ontario, in much the same manner as the Hydro-Electric Power Commission now transmits and wholesales energy to many municipalities. It is too early to pass judgment on any such scheme, but the problem is becoming so critical that the suggestion merits study.

One of the signs of the times is what has been done by the Village of West Lorne, in Elgin County. About 10 years ago West Lorne began piping water from Lake Erie six miles to the village. More recently, it has extended the supply by gravity to two other villages - Rodney and Dutton - and to serve a railroad. No doubt other municipalities will attempt similar projects, even where the cost may be much greater. There is a certain danger that patch-work schemes of municipal piping may develop in South-western Ontario, bringing water many miles from the lakes, at considerable cost. A well planned grid system serving many different municipalities might well prove to be less costly.

In this connection, it should also be pointed out that, apart from the limited water supply, many inland cities and towns are favourably situated to receive more industries and a larger population. There is much to be said against the undue concentration of several million more people in huge and overcrowded lakeshore cities - and much in favour of decentralization, particularly of the smaller industries. Not the least among the advantages of the smaller cities and towns

is that they afford an opportunity for young and old alike to go out into the countryside for recreation and health, without having to pass through mile upon mile of suburbs.

The point to be emphasized here is that with all their advantages, the inland cities and towns cannot continue to grow without more water. It is therefore recommended that:

A DETAILED SURVEY SHOULD BE MADE TO ASCERTAIN THE FEASIBILITY AND COSTS OF PIPING WATER FROM THE GREAT LAKES SYSTEM TO BE DISTRIBUTED AS A PUBLIC UTILITY FOR THE BENEFIT OF PARTICIPATING MUNICIPALITIES.

CHAPTER 23

POLLUTION

Pollution hardly requires definition. In plain language it means to make physically impure, foul, or filthy; to dirty, stain and befoul. The postwar years have seen a tremendous public interest in pollution abatement, manifest at practically every meeting of conservationists.

Pollution of Ontario rivers and streams is self-evident to the most casual observer. They are often looked upon as a convenient conveyor of anything which is not wanted. The public interest is clearly stated in the Public Health Act, which forbids the contamination of watercourses. Yet not only are rivers used as a convenient dumping-place for garbage, industrial waste, and even dead livestock, but too frequently they are used to carry off raw sewage from large urban centres. A city of 45,000 people empties raw sewage into a river channel with very little flow to flush the stream-bed in summer months. In another case the volume of effluent in the lower reaches of the river is sometimes twice as much as the measured natural flow of water - in other words, it has become an open sewage ditch through a heavily-populated area. The most efficient sewage plants of the municipalities on the Grand River discharge liquid sewage with primary treatment only, containing 30 to 35 percent of the original solid matter still in suspension.

In some instances rivers are used for domestic water supplies. While modern methods of filtration and treatment make the water potable, the colour and odour, to say the least, are objectionable. On rivers used for the dual purpose of diluting sewage and supplying drinking water, the problem is extremely serious, and increased summer flow is most important. Summer flow, in turn, if not supplied

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in sufficient quantities by the headwater springs and swamps, must be augmented by the building of conservation reservoirs. Where such conditions prevail, and especially where the river borders or passes through a large urban area, its beneficial use for recreational purposes is lost to the population.

Maintenance of water supplies free from serious pollution by sewage and industrial wastes is essential to the public safety in urban centres. At present there are 197 municipalities with public sewer systems, serving a total population of 2,750,000. While Ontario has gone much further than most other Provinces in providing sewage treatment plants, there are 83 sewered municipalities which have not yet installed sewage treatment works. Among them are some of the largest cities in Ontario. This can be attributed to a number of factors, including availability of water for diluting purposes such as in large rivers, the high cost of treatment plants, and the fact that while many of these programs were planned for completion after the war, materials and labour have not been available for this purpose. This latter situation is now adjusting itself, and it is anticipated that a number of municipalities will go forward shortly with sewage treatment programs.

The main problem related to sewage disposal is that of insuring that these wastes will be adequately treated before they reach the watercourses. Satisfactory methods are now available for this purpose insofar as domestic sewage is concerned. Some industrial wastes create great difficulties and intensive scientific research will be necessary to develop more suitable methods to meet that problem. New processes are continually being developed in the industrial field, and these create new problems in neutralizing the wastes. This is an ever-changing field. It is more aggravated where the quantity of industrial wastes is large or where it must be discharged into a small

Pollution of Ontario rivers and streams is self evident to the most casual observer. They are often looked upon as a convenient depository for anything which is not wanted.



Clean streams provide clean water, recreation facilities, and good fishing



stream rather than into public sewers. Research on methods for treating milk wastes have been proceeding in the Ontario Department of Health in an effort to find some convenient and inexpensive solution. This is but one of the many problems in this field.

Another difficulty in the smaller centres is that of indiscriminate connection of premises to storm drains. Many of these connections are made without consent of the municipality. They create offensive conditions at the outfall of the drain. In built-up areas it is often not possible to put in septic tanks or other methods of disposal. Consequently, these property owners must, in order to obtain drainage facilities, connect with the storm sewer. The solution is a public sewer system with treatment of all wastes.

Some interest has been shown in the utilization of sewage sludge for fertilizing purposes. There is a certain amount which can be made available, and if it could all be returned to the land it would be helpful. Based on today's population served with sewers, there would be approximately 350 tons of sludge (dry weight) produced each day. If returned to the land, it should be digested first, which would reduce the quantity by about one-third. It is obvious that a major portion of the sludge would not actually reach the land, and taking all factors into consideration it is doubtful if more than 50,000 tons of digested sludge could be obtained annually from the municipalities of this Province, under the most favourable circumstances. It is about equal in value to farmyard manure, which has an average analysis of 10 pounds of nitrogen, 5 pounds of phosphorous and 10 pounds of potash per ton. There are certain elements in sewage sludge which may be more helpful in some types of soil, but in general it is not considered that this material is greatly different in fertilizing value from that of manure. Taking

into consideration that the total consumption of commercial fertilizers in Ontario is 350,000 tons a year, the actual amount of fertilizer nutrients available from sewage sludge is not at present very significant.

The real problem is how to get this material back on the land. It should be digested, and it must be dewatered, if it is to be transported for any appreciable distance. An alternative is to digest it and draw it to the land in liquid form. This method is now used in a few municipalities. It is feasible for areas adjacent to the disposal works. The cost of transporting liquid sludge, which is about 99 to 99.5 percent water, is high. In the United States some of the larger centres, like Milwaukee and Chicago, have built plants for drying the sludge so that it can be shipped any required distance. It is recognized that this is not feasible except for the larger cities. The amount of sludge which could be returned to the land is but a small proportion of the fertilizer needs of this Province. It would appear therefore that the best policy is to return it in liquid or semi-dried form to the land adjacent to the sewage treatment plant.

The problem of providing adequate sewer facilities and sewage treatment, is closely related to finance. The chief obstacle to the installation of proper sewage facilities is the cost. In addition there is a widespread lack of appreciation by many people of their responsibility in providing adequate and safe disposal of all sewage and wastes.

The construction, operation and maintenance of a sewage disposal plant is a major financial undertaking for most communities regardless of size and many are limited in their financial capacity. With or without powerful laws, abatement proceeds only insofar as the public are willing to pay the cost.

A review of the record in the United States with respect to the control of stream pollution makes it reasonably clear that the basis for successful prevention and correction of abuse of streams does not lie in the mere existence of legislative enactments. It is stated by an American authority that "if any specific single feature has been responsible for progress in many of the states, it has been the existence of one or more informed officials who had sufficient energy and wisdom to carry the program forward by co-operative activity with industry and municipality. Only rarely has it been necessary in such progressive areas to invoke the law. In such cases the law has been useful but it has not been the unitary key to real progress in abatement."

It is hoped that the Municipal Improvement Corporation Act of 1950 will make it possible for many communities to undertake modern sewage treatment works.

The problem naturally arises out of population growth and industrial expansion and is by no means unique. The older settled countries of the world have encountered similar difficulties. People rarely come to grips with the virulent menace of pollution until it threatens to destroy them. Ontario, Southern Ontario in particular, is fast approaching that precarious position. It is apparent that the abatement of pollution forms part of a conservation program. Enough of the problem has been presented to suggest its magnitude and implications, which call for much careful study. This Committee believes that the Province, in co-operation with the municipalities, must take vigorous action to protect the public interest in pure water.

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CHAPTER 24

FARM PONDS

There are few farms in Ontario which would not be improved by a farm pond. It would provide a permanent supply of water for livestock, fire protection, recreation and wildlife. In many cases it would also assist in recharging the ground-water supply. The lack of water in rural areas was felt keenly during the drought of 1949, with the result that many farmers are very much interested in the matter.

Specific evidence of this interest is the recent plan of the Counties of Halton and Waterloo to use some or all of the Department of Agriculture grant for conservation projects to construct demonstration farm ponds.

There would probably be many more farm ponds in Ontario if appropriate literature and technical assistance were available to landowners. Notwithstanding the lack of information and assistance, some farmers have undertaken ponds, built by the trial-and-error method. When failures do occur, they have a deterrent effect on other farmers.

Farm pond planning does not require a highly trained technician but rather one with special training or a short course in this phase of agricultural engineering. Such trained personnel would have an intimate appreciation of how and where the farm pond should be built in relation to farm operations. The lack of trained personnel must be overcome before there will be any appreciable advance in this field of work.

One of the first points to be determined in designing a farm pond is the maximum amount of run-off that can be expected from the drainage area above the pond site, so that adequate provision can be made to carry this excess water safely from the pond. Research is needed concerning the maximum run-off on the major soil types, with different



This well kept pond is sustained by a small spring fed stream. It supplies water to the farm and already has proven its worth in fire protection.



Farm pond development offers vast opportunities for year around water supply for livestock and crops. Unless this water hole is improved and protected from livestock trampling, it will soon be useless.

vegetative cover, within the various climatic regions of Ontario.

The use of ponds for fishing is problematical in Ontario on the basis of present information. American authorities refer to catches as high as 500 pounds of fish being taken from a farm pond in a single season. There is need for further study on this point.

The Committee does not know of any Ontario publication on the design and construction of farm ponds for the guidance of would-be pond-builders. However, in the recently completed surveys of the Don, Moira and Nith River Watersheds by the Department of Planning and Development, an appraisal was made of all existing farm ponds and small dams. The most favourable sites were also selected and investigated on all three watersheds, and this information will be made available to the Authorities concerned and to the local people.

The accompanying photograph shows a pond built by one farmer at a cost of only \$75.00, which has already more than paid for itself in fire protection, as well as providing water for stock and domestic purposes. With provision for sufficient trained personnel and literature, there would be considerable development throughout the Province of this economical, multi-purpose project of water conservation and land utilization.

It is recommended that:

RESEARCH WORK SHOULD BE DONE ON THE DESIGN AND CONSTRUCTION OF FARM PONDS FOR ONTARIO PURPOSES, EXTENSION MEN SHOULD BE TRAINED TO GIVE TECHNICAL ASSISTANCE AND FURTHER EFFORTS SHOULD BE MADE TO PUBLICIZE THE MULTI-PURPOSE VALUE OF THE FARM POND.

CHAPTER 25

SMALL DAMS

During Ontario's early years of agriculture and lumbering, it was of prime importance to harness the streams and rivers for water-power and log-driving.

Within the memory of living men, when electricity was hardly known, industry depended on water-power. Along the streams and rivers hundreds of small mills sprang into being - grist mills, sawmills and textile mills. The great factory of today had its origin in a little wooden mill beside the village pond, where water turned its wheels. Some in Ontario were built over 150 years ago.

It was the practice to build small dams of earth, logs or concrete, usually less than 15 feet high. On the Ganaraska River - which drains only 103 square miles - there were in 1865 no less than 37 dams, compared to only 15 at present. Similarly, the Humber once had 55 small dams - now less than 10. The Moira had 48 - now less than 20.

The advent of hydro-electric power and the shift of industrial production to larger centres resulted in the decline of the village-mill industries; one by one they closed and fell into ruin, although a few are still in use. With their passing the dams also fell on evil days. Many were neglected or forgotten for so long that they washed out or collapsed. Others still stand in varying stages of decay.

There are believed to be about 5,000 small dams of all conditions in Ontario. Each represents a small reservoir, and most could be used effectively for recreational and other conservation purposes.

Properly maintained, the small dams could undoubtedly exert a beneficial influence on ground-water supply, fish and wildlife, the velocity of the stream and excessive flow as well as providing obvious aesthetic and recreational advantages. Brief reference can be made to each of these points.



Our rivers had formerly many mill dams which had a beneficial effect on ground water supply, wildlife habitat and recreational use. Many of these are now derelict or washed out. (Top) The mill dam at Harrington on the Thames before it was washed out in 1948 (Below) The pond as it was before the dam went out. This is now an ugly mud flat.



Every delay in the flow of surface water helps to replenish underground supplies. Seepage from even a small reservoir to underground beds has this effect. For this purpose, the more reservoirs the better.

Fish and wildlife flourish in and around stabilized mill ponds. It should be added that many ponds have become so clogged with silt and rubbish, or polluted by garbage, that a thorough job of restoration is necessary before either fish, small boys or other forms of wildlife can use the water.

Small dams tends to reduce the velocity of stream flow and dissipate its energy, thereby reducing stream bank erosion. If the velocity of a stream is low, its ability to carry soil is small, but if the velocity increases, its carrying capacity increases to the sixth power of the velocity. Thus, when velocity is doubled, carrying capacity increases 64 times, and the cutting power of the stream is increased four times.

The extent to which small dams can assist in flood control depends (as in the case of any dam) on the difference between the normal capacity and the maximum capacity, or the difference between the normal level and the level to which water can rise before escaping in the flood season. The whole reservoir could be used for flood-control purposes if it were empty prior to the spring freshets, but this procedure would not be desirable, for it would destroy many of the other values of the small dam and pond. It could, however, be lowered in the fall of the year to a level consistent with proper fish culture to provide more storage. Further by raising the dam, even if it be by only a few feet, will add to the emergency storage capacity, and in cases where the surrounding terrain is favourable this would seem worth while.

As already emphasized in discussing flood control, there is no single easy solution for that problem. Small dams have only a minor role but as part of a larger program they

could be significant. The modern tendency is to put the emphasis on large dams and large reservoirs. However, 100 acre feet of storage capacity is 100 acre feet whether in a big reservoir or a little one, and it is better to have even that much than to have nothing. Clearly, in any program of restoring small dams attention should be given to the possibility of providing emergency storage capacity, with proper controls on the dam.

The 1949 amendment to the Lakes and Rivers Improvement Act empowered the Minister of Lands and Forests to cause repair or reconstruction of any small dam. The rights of a recalcitrant owner may be forfeited to the Crown, upon payment of such compensation as may be fixed by Order-in-Council.

Other than the watersheds studied by the Conservation Branch of the Department of Planning and Development, there is little detailed information on the estimated 5,000 small dams and their state of repair. The Committee requested from the Surveyor-General an appraisal indicating the type, present use, if any, and state of repair. This work was undertaken by the Department of Lands and Forests and an interim report has been submitted on 958 dams inspected. A summary follows:

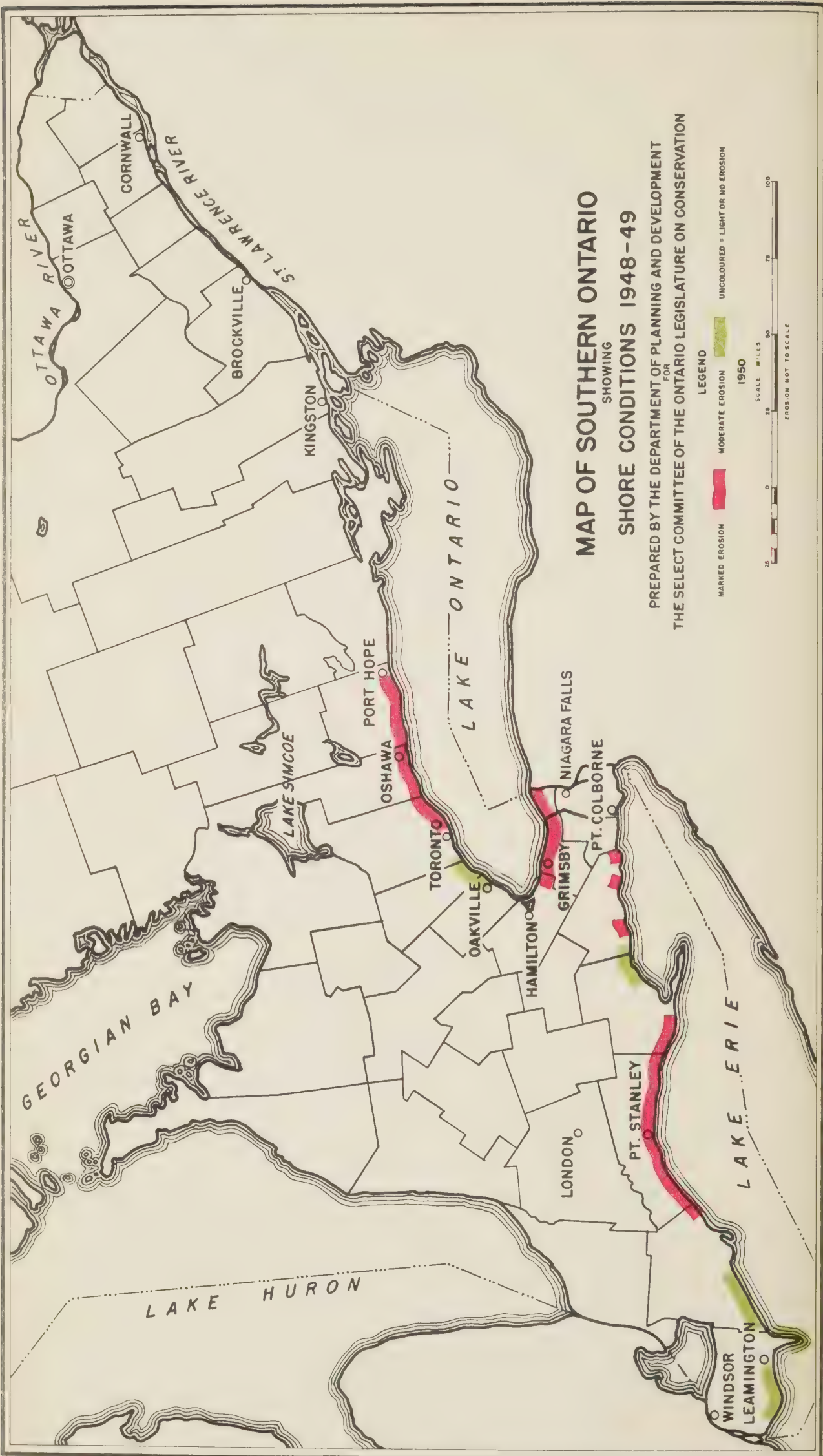
(a) Type of Dam		(b) Present Use		(c) State of Repair	
Timber	462	Mills	148	Good	359
Earth	77	Log Driving	114	Fair	254
Concrete	398	Power	35	Poor	287
Miscellaneous	21	Storage	354	Washed Out	58
		Not in Use	337		
Totals	958		958		958

It is evident that the 337 dams listed as Not in Use, and consequently with no upkeep or repair, cannot be expected to last long. Similarly, 541 dams listed as being in Fair to Poor condition will be short-lived, unless an immediate program

of restoration is instituted.

It is not proposed that all dams Neglected or Washed Out should be rebuilt with public funds, but only those dams which are located at strategic sites where such expenditure is justified for conservation purposes. It is therefore recommended that:

THE DEPARTMENT OF LANDS AND FORESTS SHOULD PROCEED WITH REBUILDING DESIRABLE DAMS THAT ARE OUT OF REPAIR AND BUILDING NEW DAMS AT STRATEGIC SITES, and WHERE PUBLIC FUNDS ARE USED IN THE REPAIR OR CONSTRUCTION OF DAMS, SUFFICIENT ACREAGE SHOULD BE ACQUIRED TO PROVIDE FOR PUBLIC RECREATION.



CHAPTER 26
LAKESHORE EROSION

Lakeshore erosion refers to the destruction of the shores of our lakes by wave action. In early times, very little attention was paid to this loss of soil, but in recent years, with the growth of cities and ports on our lakes and the increase in the value of lakeshore real estate, it has been brought to the attention of the Government. As far as Southern Ontario is concerned the area which is suffering most from this type of erosion is Lake Ontario from Cobourg to Niagara, the whole shore of Lake Erie, and the lower part of Lake Huron. The accompanying map indicates those shorelines where the recession is the greatest. The worst damage in this regard is done when the lakes levels are high, but even when they reach lower elevations the damage continues to a lesser degree. This damage includes the destruction of valuable agricultural land, such as in the Niagara Fruit Growing Belt where sections of the shore are being washed away as much as 5.9 feet a year. Also residences which formerly stood a safe distance back from the shore are endangered, roads and bridges have been undermined and harbours have been silted in.

Evidence presented to this Committee reveals that the average rate of recession of shoreline by townships fronting Lake Ontario is as follows:

Niagara	-	4.7	feet	per	year
Grantham	-	5.9	"	"	"
Louth	-	2.8	"	"	"
Clinton	-	2.5	"	"	"
Grimsby	-	0.8	"	"	"

These observations would indicate that the easterly townships (Niagara and Grantham) which occupy a more exposed position on the shore are being eroded almost twice as rapidly as the townships further west.

Progress has already been made in arriving at a solution to this menace. The Ontario Shore and Beach Preservation Association was formed on March 10, 1948, as an outcome of a conference on lakeshore erosion called by a previously existing organization with the same objects, known as the Niagara-Toronto Lake Shore Protective Association. This conference in 1948 was attended by representatives of practically every municipality in the Province bordering on the Great Lakes which has an erosion problem.

As a result of the representations made at this meeting to the Minister of Planning and Development, Dr. G. B. Langford was engaged to prepare a report on Lakeshore Erosion in the Province of Ontario. The field work for this investigation has been completed and the first section of the report, covering Lake Ontario from Niagara to Cobourg, has been published.

This problem, it should be noted, is not unique in this Province. It is world-wide. European countries, particularly Denmark, the Netherlands and England, have been fighting erosion from the seas for centuries. It is a most pressing problem on the American shores of Lakes Ontario, Erie and Michigan and along the entire lengths of the Atlantic and Pacific coasts.

This problem reached such proportions that the Government of the United States set up within the War Department, in the office of the Chief of Engineers of the United States Army, a Beach Erosion Board which has been carrying on research and giving leadership to the problem of combating shore erosion in that country.

These losses in shore erosion have today reached a point where they can no longer be considered the responsibility of the individual whose land is affected, but rather, because of the Federal Government's control of navigable waters, a problem to be considered jointly by the Dominion

The shoreline near Grand Bend on Lake Huron. Valuable agricultural land is being washed away at an alarming rate.



Lakeshore erosion at Grimsby Beach. Residences which formerly stood a safe distance back from the shore are now endangered.



and Provincial Government and the municipality concerned.

This Committee therefore recommends that:

THE DOMINION, PROVINCIAL AND MUNICIPAL GOVERNMENTS SHOULD RECOGNIZE THE PUBLIC RESPONSIBILITY FOR ASSISTANCE IN LAKESHORE EROSION PREVENTION.

Too little is known of lake currents and the effects of dredging operations, and until more precise knowledge is forthcoming, costly control structures may be inefficient.

This Committee therefore recommends that:

THE FEDERAL GOVERNMENT SHOULD BE URGED TO COMMENCE A STUDY OF LAKE CURRENTS AND THEIR EFFECTS ON SHORE EROSION.

The recognized method of combatting lakeshore erosion is by the building of sea walls of sufficient strength, jetties, groynes and other structures which will not only preserve the shoreline but also assist the natural water currents of the lakes to rebuild the beaches. Such structures are very costly and require careful planning. It is recommended that:

THE GOVERNMENT THROUGH ITS APPROPRIATE DEPARTMENT SHOULD COMMENCE THE ENGINEERING STUDIES WHICH MUST PRECEDE ANY CONSTRUCTION OF PROTECTIVE WORKS FOR THE PREVENTION OF LAKESHORE EROSION.

The approach to the solution of lakeshore erosion must of necessity originate with a desire of the municipalities affected to initiate a program of shore erosion prevention. It is fully realized that these municipalities in themselves lack the technical knowledge to effect a remedy and would be limited in their ability to finance such operations. Furthermore it is in the interest of the Province that these control measures be guided by an over-all coordinated policy, whereby the programs of several municipalities would be complementary. Permissive legislation of this type has already proven successful in the Conservation Authorities Act, and it is recommended that:

LEGISLATION SHOULD BE ENACTED, AUTHORIZING THE
CREATION OF LAKESHORE AUTHORITIES TO DEAL WITH
SHORE EROSION.

Despite the inroads being made by shore erosion on sections of the Great Lakes there are a few localities where homes and buildings are constructed near the cliff and they are now, or soon will be, endangered by its recession. Every municipality that is faced with this problem should take steps to prevent any extension of this folly by refusing building permits near the water's edge. It is an expensive matter to stop the encroachment of the lake on the land, but it is a comparatively simple matter to restrict building in the endangered areas of these shores. This Committee recommends that:

MUNICIPALITIES SHOULD BE GIVEN THE AUTHORITY
TO RESTRICT OR PROHIBIT FURTHER BUILDING IN DANGER
ZONES NEAR CLIFFS OR ERODING SHORELINES.

THE IMPORTANCE OF FORESTRY

Forestry is the production of a crop of trees from which products of commercial value may eventually be harvested. One difference between the typical farm crop and the forest crop is that the farm crop is usually sown and harvested each year, whereas the forest crop must be allowed to grow for a number of years until the trees have sufficient volume to be worth harvesting. Another difference is that the well-managed forest becomes a self-perpetuating crop.

Good forestry practice proceeds on the assumption that it will produce wood products at a profit. Regardless of such profit, however, forest areas in themselves have an intangible and beneficial effect on the countryside and on the whole economy. They are the natural covering for headwater areas such as swamps and gravel moraines which give rise to many small tributary streams, and the only crop which can be grown on the extensive rocky areas of the Province. They embrace many of the other factors included in the conservation scheme such as surface or underground water storage, wildlife management and recreation. Some authorities even maintain that they influence the climate and rainfall. Apart from their material importance, they are justifiably regarded as a source of health and physical and mental well-being for those who live in or near them.

The whole subject of forestry was exhaustively reviewed by Major-General Howard Kennedy in his Report as a Royal Commissioner in 1947. While recognizing the importance of forest management on Crown lands in Northern Ontario, this Committee has necessarily directed its attention to the problem of reforestation and woodlot management, mainly in Southern Ontario, a highly important aspect of any conservation program.

The basic problem of forestry is a simple one. It is that the forest crop takes not one season but a generation



A well managed woodlot. Most woodlots of hardwood trees will renew themselves if cattle are excluded, thus maintaining a cover which will hold snow and water long after they have run off the cleared land.

before it is ready for the harvest. The life span of man is approximately three score years and ten; the growing life of our most important forest crops is just about the same. Human nature being what it is, individuals are slow to see any advantage in planting or caring for a crop which will be reaped by individuals yet unborn. This is particularly so in North America where the traditions of continuity are not strongly established, where land and forests are not highly valued and are bought and sold more frequently than they are passed down from father to son. On this continent there has always been a tendency to think that "the future will take care of itself". The temptation to gain a profit today at the expense of future needs is a strong temptation, and it has from time to time attacked the individual landholder, corporations large and small, and also governments.

This Committee has tried to consider forestry and reforestation from a conservation point of view. This means accepting the principle that it is necessary to make sacrifices - such as spending money - now, although the returns from that investment will be postponed for many years. If it is a sign of wisdom for the individual to save and invest money for his future security, by the same token it is surely a sign of wisdom for us collectively in the Province to save and invest in the future security of Ontario by renewing our resources of wood. It is too much to expect the individual citizen to engage in reforestation in a large way. It is not too much to demand that society as a whole should do so. Wherever the individual can participate, he should be encouraged. The municipalities can do more than the individual and should receive every encouragement. The Province, however, should accept the major share of responsibility.

It has become fashionable to describe our industrial age as the "age of steel" or the "age of oil". Sometimes people assume that wood is a thing of the past. It is well to remember that ore mines and oil fields do not and cannot renew

themselves. On the contrary, they are being inexorably exhausted. Whether they will last 100 years or 1000 is not known, but it is certain that they will not last forever, even if used only at the present rate.

Wood, on the other hand, is a renewable resource. Properly managed it is a self-perpetuating crop. Moreover, there are scientists who believe that the wood industry is only in its infancy, that its greatest triumphs are yet to come. One of the most surprising developments of World War II was the Mosquito aeroplane - mostly made of wood. Even greater surprises are on the horizon, and have encouraged one scientist to write a book: "The Coming Age of Wood". The significant fact is that the importance of wood in our civilization is not decreasing, it is increasing.

CHAPTER 28

THE FARM WOODLOT

The woodlots of Southern Ontario are a valuable asset both to individuals and to the economy of the Province. Too often the emphasis in farm forestry has been placed on the necessity of replanting unproductive corners of the farm. However, the proper management and production of existing farm woodlots should come first. It is just as essential to conserve what is already established as to wait for the maturing of a planted forest.

It is self-evident that woodlots, especially in South-western Ontario, have been depleted in the last few years to an alarming degree. Statistics for percentage of woodlots do not tell the whole story. While the figures indicate that woodland occupies 10 per cent in Southern Ontario, it is known that at least 135 townships have under 5 per cent. Moreover, many of the woodlots classed under the census as woodlands are in bad condition from overcutting and grazing. Of 419,000 acres of farmers' woodlots examined in surveys of the Department of Planning and Development for 10 Conservation Authorities, 73 per cent show evidence of grazing.

Efforts to improve woodlot conditions commenced as early as 1908, when the Exemption of Woodlands from Taxation Act was passed, which permits exemption from taxes on one acre in ten used for forestry purposes. Although the original Act has been amended several times, it has not been very effective. The slight saving in taxes has not been a strong inducement to conserve wood.

In 1946 a more effective means of preventing the wasteful cutting of private woodlots was attempted with the passing of the Trees Conservation Act. Briefly, this statute empowers municipalities, with the approval of the Minister of Lands and Forests, to pass by-laws restricting the cutting of trees under certain conditions. A principal object of the Act

was to discourage the commercial cutting of trees before maturity, which is very wasteful. At the close of 1949, only 17 counties had passed such by-laws, and many with large acreages of woodlots have refrained from using the compulsion provided by this Act. This is not good enough. It must be emphasized that such restrictions do not prevent an owner from cutting and selling off mature timber at the time when it should be harvested. Nor do they prevent the owner from cutting wood for his own use. The necessary restrictions are to stop commercial cutting of young trees, which occurs when such wasteful and short-sighted practices are temporarily profitable. Woodlots cannot renew themselves, they cannot be self-perpetuating if they are clear-cut without the slightest regard for permanent values or future needs. There has been too much clear-cutting in recent years. This Committee therefore recommends that:

THE TREES CONSERVATION ACT OF 1946 SHOULD BE
REPEALED AND SIMILAR LEGISLATION ENACTED WHICH
WOULD APPLY TO ALL COUNTIES AND MAKE PROVISION FOR
ENFORCEMENT.

The worst enemy of the forest is fire, and although an efficient fire service has been established in Northern Ontario by the Department of Lands and Forests, no protection service has been organized for most of Southern Ontario which lies south of the established forest fire districts. This means that privately owned forests - mostly farm woodlots - have no protection from this menace, in spite of the fact that the income from them amounts to a figure estimated at \$9,403,806 for 1940. The Department of Lands and Forests already maintains a large fire-fighting service operating through the Empire of the North, with highly-trained and experienced personnel. It would not be economical to duplicate that service. What is proposed is that its operations should be ex-

tended farther into Southern Ontario. This Committee therefore recommends that:

ON APPLICATION TO THE MINISTER OF LANDS AND FORESTS, THE BOUNDARIES OF THE FIRE DISTRICT SHOULD BE EXTENDED TO INCLUDE THOSE MUNICIPALITIES OR AREAS THAT HAVE 25 PER CENT OR MORE OF THEIR AREA CLASSIFIED AS WOODLAND, SLASH, WASTE OR SWAMP LANDS, and

IN ALL OTHER MUNICIPALITIES THE MINISTER OF LANDS AND FORESTS SHOULD BE EMPOWERED TO ENTER INTO AGREEMENTS TO PROVIDE FOREST FIRE PROTECTION AND TO CHARGE A PORTION OF THE COST BACK TO THE SAID MUNICIPALITY.

It is improvident to sell a woodlot to be clear-cut, for reasons already explained. Unfortunately tax law encourages the farmer to do what he ought not to do and discourages him from cropping his woodlot from time to time as he should.

This Committee is informed by officials of the National Revenue Department that if a farmer sells a woodlot or trees as they stand to a lumberman who fells them, the proceeds of the sale is a capital gain and is not subject to income tax. Similarly, if a farmer sells land with standing trees and then buys back the land after the trees have been cut off, these transactions constitute a capital gain to the farmer and are not subject to tax. These are wasteful practices. On the other hand, if a farmer fells trees as they become mature and sells them (which is the proper practice) then the proceeds constitute taxable income. Thus the farmer is rewarded for doing the wrong thing and penalized for doing the right thing with his woodlot.

On inquiry the Committee is informed that the rulings cited above are not based on any particular section of the

Income War Tax Act, but simply apply the recognized distinction between capital gain and annual income. It is, in other words, a matter of interpretation. This is a clear case of the law being in conflict with an elementary principle of conservation, and there is evidence that the law has actually encouraged some owners to sell their woodlots for wasteful cutting. The Federal Government is interested in reforestation and proper forest management, as shown by the Canada Forestry Act of 1949. It should be possible therefore to remedy the anomaly created by income tax rulings. It is recommended that:

THE DOMINION GOVERNMENT SHOULD BE ASKED TO
CONSIDER AMENDING THE INCOME WAR TAX ACT SO THAT
LANDOWNERS WILL NO LONGER BE PENALIZED FOR
CROPPING THEIR TIMBER IN ACCORDANCE WITH CONSER-
VATION PRACTICES.

CHAPTER 29

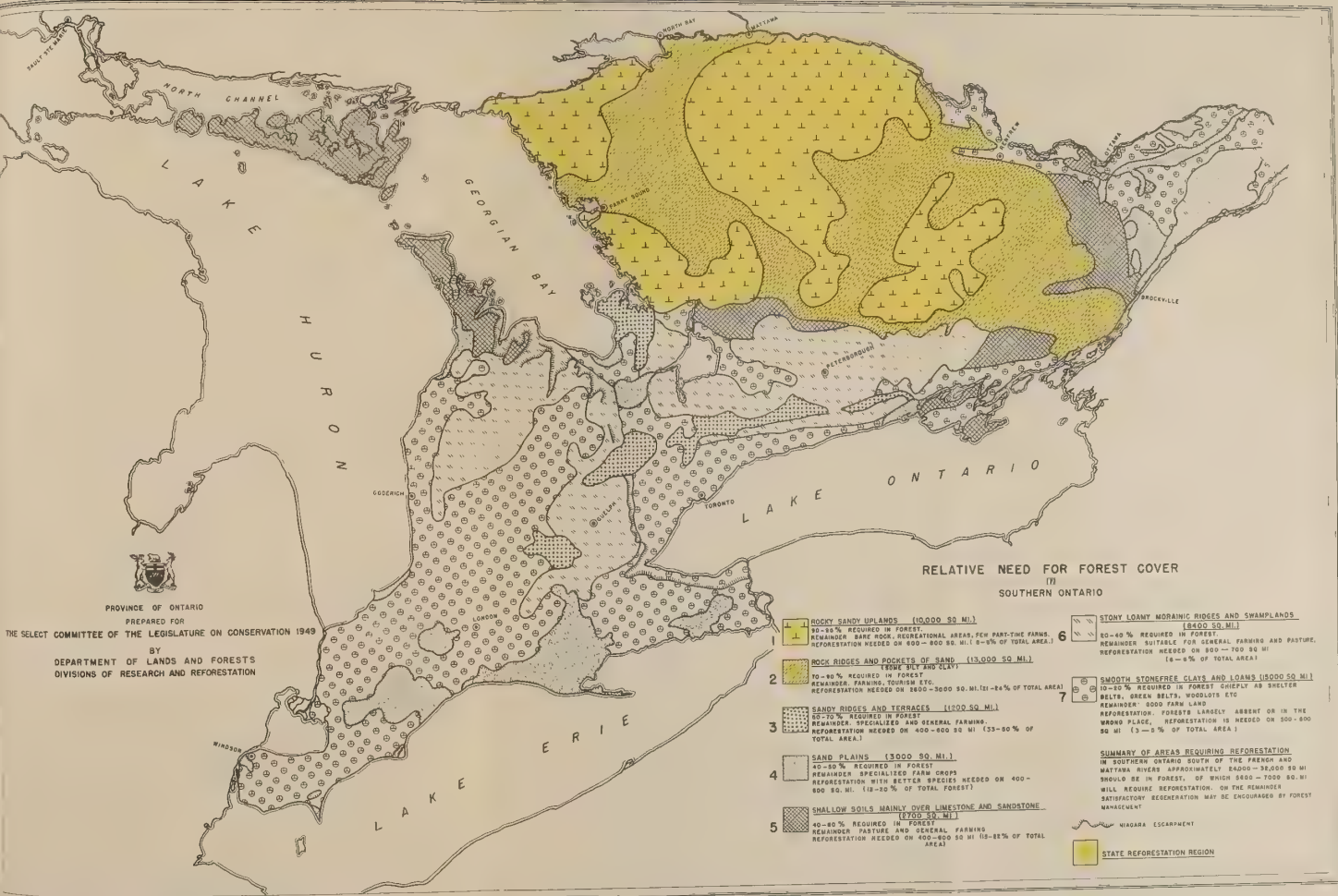
REFORESTATION BY AREAS

Southern Ontario, south of the French and Mattawa Rivers, may be divided into seven main topographic areas shown on the accompanying map as follows:

	<u>Total Area Sq. Miles.</u>	<u>Plantable Land Sq. Miles</u>
(1) Rocky and Sandy Uplands	10,000	700
(2) Rocky Ridges and Pockets of Sand	13,000	2,900
(3) Sandy Ridges and Terraces	1,200	500
(4) Sand Plains	3,000	500
(5) Shallow Soils Mainly over Limestones and Sandstones	2,700	500
(6) Stony, Loamy Morainic Ridges and Swamplands	8,400	600
(7) Smooth, Stone-Free Clays and Loams	15,000	650
	<u>53,300</u>	<u>6,350</u>

These seven topographic areas can be sub-divided into two broad classifications, namely, the Precambrian Shield, which includes the first two areas above, coloured yellow on the map, comprising 23,000 square miles, and the uncoloured areas, three to seven above, which cover the remaining land surface of Southern Ontario with its rich farmland country, comprising 30,300 square miles. Of this total of 53,300 square miles, about 28,000, as stated in the summary on the map, should be in forest, and 6,350 square miles, or about 4,000,000 acres now requires planting.

The Southern part of the Province is where the counties and private planters for the most part are carrying on reforestation today, and such work should be continued and accelerated. The Precambrian Shield, however, requires special consideration.



CHAPTER 30

DOMINION-PROVINCIAL REFORESTATION

The Precambrian Shield, comprising 23,000 square miles, covers 10,000 square miles of rocky and sandy uplands and 13,000 square miles of rock ridges and sand pockets. It includes Algonquin Provincial Park and the topography is similar to that of the Park, although most of it lies at a lower elevation. Of this area, 3,600 square miles, or 2,300,000 acres should be reforested.

It is the opinion of this Committee that the Province should institute a large-scale program of reforestation and careful management in the Precambrian area, with the co-operation of the Dominion Government under the provisions of the Canada Forestry Act, (a federal statute of 1949, second session). This is a long-term project of great magnitude, but its ultimate value would be tremendous. It cannot be undertaken without a much larger supply of trees from Provincial Nurseries. Its importance would be national, and it is therefore a proper subject for participation by the Dominion Government. It is therefore recommended that:

THE PROVINCE SHOULD UNDERTAKE TO REFOREST APPROXIMATELY 3,600 SQUARE MILES OF THE PRECAMBRIAN SHIELD AREA DURING THE NEXT TWENTY-FIVE YEARS, and

THE PRESENT PROVINCIAL FOREST NURSERIES SHOULD BE EXPANDED OR NEW NURSERIES ESTABLISHED TO PROVIDE SUFFICIENT TREES TO REACH THE 25-YEAR OBJECTIVE, and

THE PLANS FOR LARGE REFORESTED AREAS SHOULD PROVIDE SUITABLE LOCATIONS FOR PUBLIC RECREATIONAL USE, and

ALL SUMS EXPENDED FOR SUCH REFORESTATION IN THE PRECAMBRIAN AREA SHOULD BE CHARGEABLE AS EXPENDI-

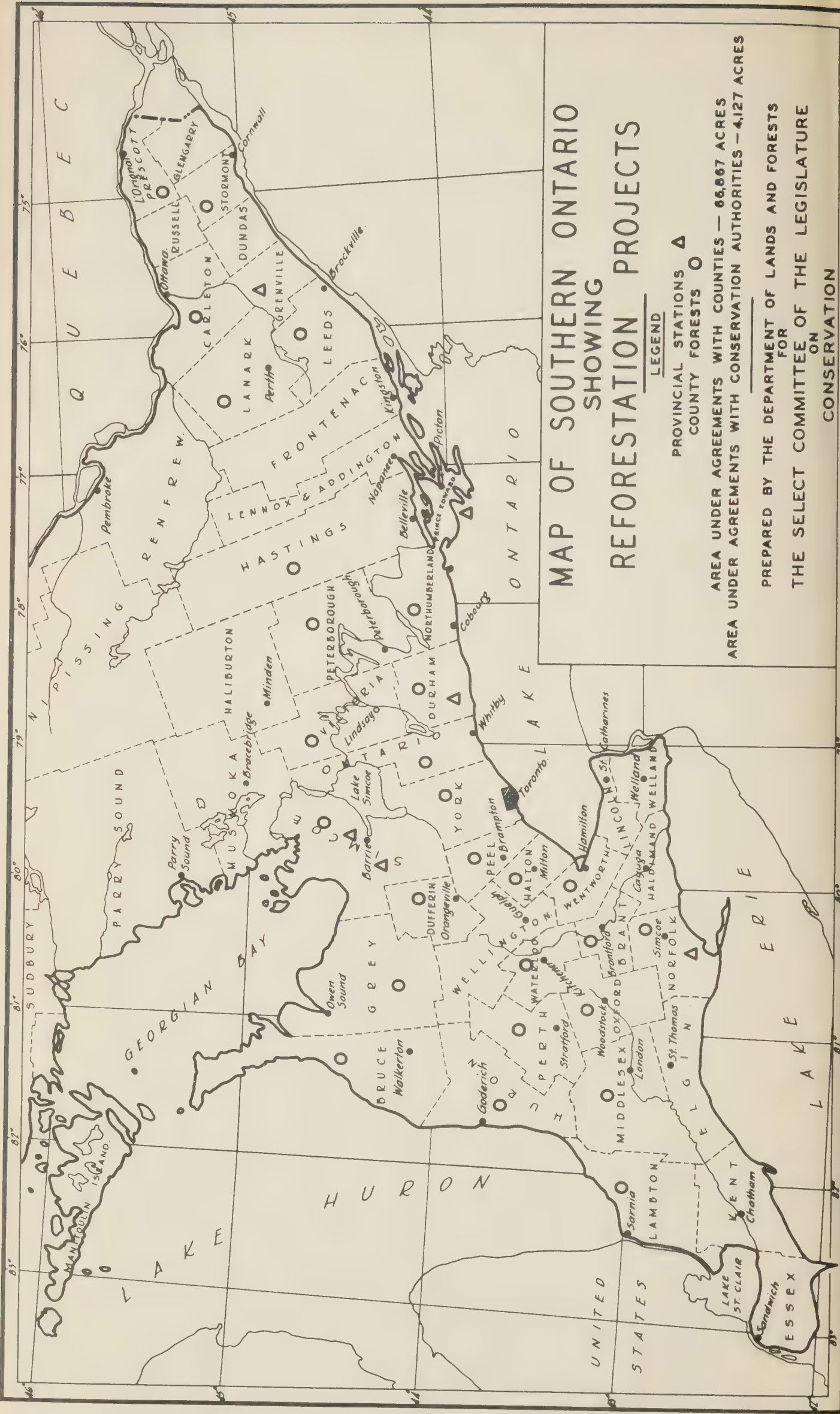
TURE UPON CAPITAL ACCOUNT, AND FINANCED AS A
JOINT DOMINION - PROVINCIAL PROGRAM.



Many square miles of cut over, burned over land of the Precambrian Shield of Southern Ontario require reforestation. It is unlikely that private capital will be invested in the rehabilitation of these lands.

These lands can be developed into valuable forest areas with unlimited tourist possibilities.





MAP OF SOUTHERN ONTARIO SHOWING REFORESTATION PROJECTS

LEGEND
PROVINCIAL STATIONS 
COUNTY FORESTS 

AREA UNDER AGREEMENTS WITH COUNTIES — 66,867 ACRES
AREA UNDER AGREEMENTS WITH CONSERVATION AUTHORITIES — 4,127 ACRES

PREPARED BY THE DEPARTMENT OF LANDS AND FORESTS
FOR
THE SELECT COMMITTEE OF THE LEGISLATURE
OF ONTARIO
ON
CONSERVATION

CHAPTER 31

MUNICIPAL REFORESTATION

The value of municipal or communal forests is not new. In Europe communal forests have existed for several hundred years. The best known is that of the Swiss city of Zurich. Zurich has a municipal forest of 5,000 acres which has been under management for over 600 years, yielding net annual revenues up to \$15 per acre. Many examples of municipal forests could be cited in different parts of Europe and in Eastern United States. In most of these municipal forests the net revenues assist in maintaining public works and lessen the burden of municipal taxation.

In 1911 the Ontario Legislature passed an Act entitled The Counties Reforestation Act. Several amendments have been made to it since that time but it remains the same in principle and is now known as The Municipal Reforestation Act. The Act makes it possible for a county or a township to carry on reforestation projects.

The municipality may purchase the land and enter into an agreement with the Crown for development and management or to carry out such work without an agreement. All by-laws pertaining to the purchase, management or subsequent sale of such lands require the approval of the Minister of Lands and Forests.

Although this legislation was enacted in 1911, it lay dormant until 1922. In that year the County of Simcoe initiated the program of municipal forestry by purchasing 1,000 acres, now known as the Hendrie Forest. Simcoe County today has over 11,000 acres of municipal forests.

Under the provisions of the Act, counties and townships may enter into an agreement with the Crown to take over the development and management of the forest. Upon the municipality purchasing the land, the Crown administers the property for a period of 30 years. At the end of that time one of three options may be selected.



A municipal forest of red pine five years after planting

First, the municipality and the Crown may renew the 30-year agreement, sharing equally in cost and profit thereafter. Second, the municipality may take over the project, paying the Crown the cost, without interest, of the development, less monies, if any, received by the Crown out of said lands. Third, the municipality may convey the lands to the Crown, upon payment of the purchase price, without interest.

Since the beginning of municipal forestry in 1922 great strides have been made in this work by certain counties, and in smaller holdings by townships, with the result that up to June, 1949, the total acreage in municipal forests under the Act amounted to 78,572 acres.. (See accompanying table).

When the Act was first passed it applied only to counties. Since then it has been broadened to include townships. From submissions made to this Committee it is clear that many urban centres also wish to establish forests. It is desirable that this trend should be actively encouraged. This Committee recommends that:

LEGISLATION SHOULD BE ENACTED PERMITTING URBAN MUNICIPALITIES TO PURCHASE LAND OUTSIDE THEIR LIMITS FOR REFORESTATION PURPOSES, and

THE MUNICIPAL REFORESTATION ACT SHOULD BE AMENDED SO THAT CITIES, TOWNS AND VILLAGES MAY ENTER INTO A FOREST MANAGEMENT AGREEMENT WITH THE PROVINCE ON THE SAME BASIS AS COUNTIES AND TOWNSHIPS, WITH PROVISION THAT THE TAXATION OF THEIR REFORESTED LANDS SHOULD BE BASED ON A FIXED ASSESSMENT, SUBJECT TO REVIEW AT REGULAR INTERVALS BY THE ONTARIO MUNICIPAL BOARD.

Periodically certain lands suitable for forestry are sold for non-payment of taxes. Under the present law such lands must be put up for auction at the first tax sale. This Committee recommends that:

LEGISLATION SHOULD BE ENACTED PROVIDING THAT
TAX-DELINQUENT LANDS MAY BE ACQUIRED BY A MUNICIPALITY
OR BY THE PROVINCE FOR REFORESTATION PURPOSES.



Thinning operations in a municipal forest of red pine 20 years old provide pitprops and fuel wood

The first harvest from a municipal forest



MUNICIPAL FORESTS 1949

(in Acres)

County	Under Agreement	Not Under Agreement	Others ^M	Total
Brant	50	9	-	59
Bruce	11,860	90	180	12,130
Carleton	-	700	-	700
Dufferin	1,826	235	-	2,061
Dundas	-	124	-	124
Glengarry	-	200	-	200
Grey	3,697	223	208	4,128
Halton	650	-	50	700
Hastings	-	429	100	529
Huron	496	35	5	536
Kent	-	20	-	20
Lambton	-	700	-	700
Lanark	2,100	-	-	2,100
Leeds & Grenville	1,867	7	-	1,874
Lennox & Addington	-	12	18	30
Middlesex	-	240	-	240
Norfolk	-	1,723	-	1,723
Northumberland & Durham	3,375	-	116	3,491
Ontario	1,775	50	-	1,825
Oxford	637	10	172	819
Peel	-	65	-	65
Perth	100	75	15	190
Peterborough	-	5,145	18	5,163
Prescott & Russell	14,416	219	200	14,835
Simcoe	10,999.7	410	-	11,409.7
Stormont	-	70	-	70
Victoria	4,504	-	-	4,504
Waterloo	275	98	49	422
Wellington	728	-	-	728
Wentworth	400	5	29	434
York	3,097	65	-	3,162
River Valley Authority				
Ganaraska	3,600	-	-	3,600
Thames	-	1,633	-	1,633
Total	66,452.7	12,592	1,160	80,204.7

^M

Others - School, town and township forests.

PRIVATE REFORESTATION

Free distribution of trees to private planters began in 1905 with an output of 10,000 trees. By 1914 this had increased to 500,000. After World War I, and especially following the establishing of nurseries at Midhurst and Orono, the output of planting stock increased. In 1939 the number of trees distributed for such work reached 7,500,000 and by the end of 1949 the figure had climbed to 11,000,000. The total distribution in 1949 for all purposes, both public and private, was 17,700,970.

A study of the results of this distribution over the past 45 years shows that with private planting a very large percentage of loss has occurred. This was particularly true of hardwood plantations attempted on heavy clay soils. The losses sustained are attributed to many causes, the outstanding being improper or careless planting methods, grass and weed competition, the depredations of mice and rabbits and of course grazing by livestock. The distribution of forest trees and their proper development depend on correct planting plans being made with experienced forest officers or trained men in the field. Thus a very important development in reforestation for Old Ontario is the placing of Zone or District Foresters in centres throughout the southern portion of the Province. There are now a number located at strategic points. Forestry, like agriculture, deals with the best use of the soil, and better results will be achieved by landowners consulting District Foresters on their own property than by obtaining advice through letters or bulletins from Toronto. In most cases, practical assistance on problems dealing with forestry can be given best by personal contact and inspection on the ground.

Planting losses are minimized when trees are planted at the right time and in the proper way under supervision. It is apparent that excellent results can be achieved with modern



*We have wasted much resources in attempting agriculture on lands of limited capabilities.
Part of the sandy ridges in south central Ontario that require forest cover.*

tree-planting machines and experienced men. These are not now available to the average landholder, but this Committee believes they could be made available economically through the facilities of the Department of Lands and Forests.

A serious problem arises where concessions or inducements are offered the private owner to encourage private reforestation. He himself may be an ardent conservationist or a lover of trees. But what about his successors? Will his son or a subsequent purchaser follow the rules of good woodlot management, or will he sell the stand to some passing operator who seeks a quick profit by cutting off all the trees - young and old?

This Committee suggests that private owners be encouraged, financially and otherwise, to make private plantings, but only where they voluntarily enter into an agreement with the Department of Lands and Forests, providing that the lands shall remain under forest management. Such an agreement should include a covenant running with the land, which would be binding upon the grantor, his heirs, executors, administrators and assigns. This would not prevent them from realizing a revenue from the forest crop in due time; it would protect the reforested lot from being abused by thoughtless and short-sighted persons. It would be voluntary, but once executed and registered it would remain on the title. This Committee believes that in the long run it would enhance the value of the property subject to such a covenant.

In order to assure more success in private planting, this Committee recommends that:

THE DEPARTMENT OF LANDS AND FORESTS SHOULD SET UP A SYSTEM WHEREBY TREE-PLANTING MACHINES AND PERSONNEL AS WELL AS TREES ARE MADE AVAILABLE FOR REFORESTATION OF FIVE ACRES OR MORE ON PRIVATE LANDS, SUBJECT TO THE FOLLOWING CONDITIONS:

(1) WHERE AN AGREEMENT IS MADE BETWEEN THE LAND-

OWNER AND THE CROWN PROVIDING THAT THE LANDS REFORESTED SHALL REMAIN UNDER FOREST MANAGEMENT, THE LANDOWNER SHALL BE REQUIRED TO PAY ONLY A PERCENTAGE OF THE COST OF THE REFORESTATION.

- (2) WHERE NO SUCH AGREEMENT IS MADE BETWEEN THE LANDOWNER AND THE CROWN THE OWNER SHALL BE REQUIRED TO PAY THE FULL COST OF REFORESTATION.

It has been the practice of the Department of Lands and Forests to distribute trees for planting free of charge. The purpose was to encourage reforestation, and with this purpose the Committee is wholly in accord.

However, there is evidence that the free trees are carelessly handled in many cases, probably because it costs nothing to obtain them. It is reasonable to suppose that they would be more carefully handled if even a small price were attached. This might not have been possible in the early days of distribution, but recently the demand has exceeded the supply.

Moreover, submissions to this Committee indicate that considerable stock from Government Nurseries is being utilized for the commercial Christmas tree trade. This is an industry to be encouraged on submarginal agricultural lands, but it is also a revenue-producing industry. In the opinion of this Committee nursery stock for such purposes should not be distributed free.

Therefore, and in order to assure more careful planting on private land, it is recommended that:

A NOMINAL CHARGE SHOULD BE MADE FOR NURSERY STOCK DISTRIBUTED BY THE DEPARTMENT OF LANDS AND FORESTS.

NURSERIES

Reforestation has as its starting point the gathering of tree seed of suitable species in the required quantity. Most of the gathering is done in Northern Ontario by the Department of Lands and Forests and sent to the Provincial Seed Extracting Plant at Angus, Ontario. This station was established in 1923 and is equipped with the most modern methods of extracting, cleaning and storing tree seed. From here the seed is shipped as required to five Provincial nursery stations, where seed-beds bring the trees to life for distribution in later years.

The policy of establishing Provincial Forest Stations in areas containing large tracts of submarginal lands was inaugurated in 1908, when the field work in forestry was transferred from the Ontario Agricultural College at Guelph to South Norfolk, near the village of St. Williams. This Provincial Forest Station was established with the thought that suitable forest nursery soils could be found, and adjacent areas could be secured, which would lend themselves to demonstrations of reclamation work and future forest management. Nursery work being seasonal, the adjacent reforested areas make it possible to keep a permanent trained nursery staff, the care and management of the young forests providing winter employment.

New Stations have been established since, under the same plan as the original Station in Norfolk, and have been located in suitable areas to serve all parts of Old Ontario. These stations, with their locations, dates of establishment and acreages are as follows: St. Williams in Norfolk County, 1908, 4,000 acres; Midhurst in Simcoe County, 1922, 2,500 acres; Orono in Durham County, 1922, 900 acres; Kemptville in Grenville County, 1945, 1,500 acres; Thunder Bay at Fort William, 1946, 400 acres.

A forecast of the amount of planting stock for any future period must be tempered by such factors as the availability of seed and the vagaries of weather. These two factors have, however, been largely corrected by improved nursery practices.

It takes two to three years to produce satisfactory planting stock: one to two years in seed beds and one to two years as transplants. The nurseries are now equipped to produce from 50,000,000 to 60,000,000 plants in the seedling stage, and with the development of sub-stations attached to the major reforestation areas the total available planting stock could reach at least 60,000,000 trees a year.

Since the beginning of reforestation in Ontario up to and including 1949, the distribution of trees for all purposes has been 294,930,000. The work, however, did not get into its stride until 1926, when the two additional nurseries at Midhurst and Orono reached production. From 1905, the first year of distribution, to 1925, a period of 21 years, the total distribution was only 16,058,000. From 1926 to 1949 inclusive, a period of 24 years, the distribution for all purposes was 278,872,000. At 1,000 trees to the acre, this would represent approximately 294,930 acres, which have been planted. However, as previously mentioned, there has been considerable loss through natural and other causes, and if this is put at the conservative estimate of 25 per cent, the above figure would be reduced to 221,196 acres. If it is conceded that 4,000,000 acres of Southern Ontario require planting, the number of acres remaining for such work would be 3,778,804. For a 25-year program this means that 151,632 acres per year should be planted, requiring a nursery output of 151,632,000 trees per year. While the above figures are only approximate (for example they do not include Northern Ontario where most of the nursery stock produced in the Thunder Bay Nursery will be used), they certainly indicate the tremendous task which confronts us in re-planting and managing



There are many thousands of acres of shallow soils over limestone outcrops that require reforestation. These are mostly in Eastern Ontario, Bruce Peninsula and Manitoulin Island.

the potential forest lands of Southern Ontario.

SUMMARY OF REFORESTATION DATA

	Area in Acres	Trees Required
State Reforestation	2,300,000	2,300,000,000
Municipal and Private	1,700,000	1,700,000,000
Northern Ontario	Requirements not known	
Totals	4,000,000	4,000,000,000
Planted to Date	221,196	221,196,000
Balance to be Planted	3,778,804	3,778,804,000
Output of planting stock 1949		17,700,970
Estimated output of planting stock by present nurseries and proposed sub-stations in the near future		60,000,000
Trees required per year for a 25- year program as outlined		(150,000,000

CHAPTER 34

FINANCIAL RETURNS FROM REFORESTATION

In addition to indirect benefits such as ground-water supplies, amelioration of floods, wildlife protection and other influences, reforestation has definite financial returns. In support of this the following data are submitted, based on studies of reforestation areas in Southern Ontario, some of which are 40 years of age. Red pine is used as an example because it thrives on sandy soils, has few serious insect and disease enemies, and has splendid marketing possibilities during the early years of rotation in the form of poles and pulpwood. The data here given are based on an area of at least 1,000 acres, which allows for sufficient spread for supervision. Furthermore, it should be pointed out that over the years there has been a considerable fluctuation in the cost of planting, price of land, and to a lesser degree in the cost of supervision. Land costs have been as low as \$2 or \$3 per acre; planting costs have been considerably less than shown, and can be reduced by the use of more planting machines. The cost of supervision is based on the salary of a resident caretaker on 1,000 acres, although this could be reduced further if the area under supervision were 2,000 or 3,000 acres.

Costs of Red Pine - 60 Year Rotation

Trees Planted 8 x 8 or 680 Trees per Acre
3% Compound Interest

Item	Amount \$	Total in 60 Years \$
Land	10.00 per acre	58.91
Planting, including trees	20.00 per acre	117.82
Management	2.00 per acre per year	326.10
Taxes	10.00 per acre (land only)	65.00
Total for one acre		567.83

Returns from One Acre of Red Pine

30-Year Rotation

Trees Planted 8 x 8, or 680 Trees

(All figures based on stumpage values)

1. Thinnings of 200 trees at 30 years of age
3,000 bd. ft. @ \$20.00 \$60.00
10 cords pulpwood @ \$3.00 \$30.00
\$90.00
2. Thinnings of 150 trees between 40 and 55 years of age
5,000 bd. ft. @ \$20.00 \$100.00
15 cords pulpwood @ \$3.00 \$ 45.00
\$145.00
3. Allowing for losses from the 680 trees planted, it is estimated that there should be at least 200 dominant trees left for the final crop.

200 - 15-inch trees for saw timber,
30,000 bd. ft. @ \$20.00 \$600.00
or
4. 200 - 15-inch trees as poles, at present
Crown stumpage rates \$700.00
5. Previous returns from thinnings could be put back into the operation, or kept separate as a credit at the end of the Rotation.
(1. above) \$90.00 for 30 years @ 3% \$218.00
(2. above) \$145.00 for 10 years @ 3% \$194.87
Total per acre \$1,012.87

If poles harvested (4. above) add \$100.00 \$1,112.87
Deduct cost of establishment per acre \$ 567.83
Net profit per acre \$ 445.04

FOREST RESEARCH

Forest research by the Ontario Government is confined largely to the Department of Lands and Forests, where a research organization was set up in 1944. This re-organization did not end all investigative activities in other divisions of the Department, but did transfer all formal research to the new body. The Department's research is largely carried on with a definite end in view, that is greater efficiency and practical results.

The forest is considered as a complex and not merely as a source of wood. The program of the Division is arranged so that the emphasis on certain matters is proportional to their value. This is as follows:

- (a) Protection of existing wood and wildlife resources from fire, insects and disease.
- (b) Assessment of quantities of resources.
- (c) Maximum yields consistent with continuity.
- (d) Maximum use of yields.
- (e) Restoration of forest resources where they are deficient.

The basic improvement of all processes in the operations listed above and the development of new processes, products and uses is the role of research. Achievements of research can be measured against the standard set by the five classifications above.

(a) Protection

The Fire Protection Service has been aided in the testing of commercial fire pumps and hose; by treating the latter with fungicides to prevent decay; by the production of special equipment for transportation and trenching; and by increasing the life and effectiveness of fire-fighting tools.

In the field of aircraft operations, a device has been produced for landing on "glassy water" which will make the work of the bush pilot much easier and safer.

Research into the protection of wildlife from disease and other enemies is proceeding under the wildlife

section of the Division. Protection from insects is carried on co-operatively with the Dominion Science Service which operates in Ontario from the Forest Insect Laboratory built at Sault Ste. Marie at the expense of the Ontario Government. Spraying operations against the spruce budworm were carried on in 1944 - 46 over 125 square miles of forest in Western Ontario.

Protection against tree disease is to be undertaken by the Dominion Science Service under a co-operative agreement already written on the same general terms as for forest insect protection. The tree disease laboratory is to be erected at the Southern Research Station near Maple, Ontario.

(b) Assessment

Improvement in the collection of numerical data on forest life, either plant or animal, is sought through improvements of statistical methods employed on surveys. An important phase of the statistical work is to develop techniques for deriving significant population figures from the relatively small samples that can be taken in actual surveys of woodland or fish and wildlife. Specific examples of the need for such work are found in surveys to determine volumes of forest products; amount and kind of young growth coming in after logging or fire; and population of fish or wildlife in a given area.

Under this heading also may be mentioned the soil surveys which are being carried on and include a broad separation of agricultural and forest lands according to present economic conditions; the rating of forest land according to productivity; and the soil and nutrient requirements of species.

(c) and (d) Maximum Yields and Use

This means maximum extraction of products and development of new products and uses. This has been aided by research in several ways and covers specific problems such as

mechanical improvement of small sawmills; the complete utilization of sawmill waste; use of waste pulp liquor and uses for lignin now largely wasted; and research into the extraction of conifer leaf oil.

(e) Restoration

The first step toward this is a series of regeneration surveys of cut-over land to determine the nature of the young forest and the extent of work required to rehabilitate it to a satisfactory level. There is wide variance in the ideas of foresters and biologists as to what constitutes satisfactory maximum population levels, but at least most are agreed on what should constitute a minimum. There is also no important differences of opinion on the fact that adequate natural regeneration does not follow many of our present logging methods on certain sites. An example of a change in method that has produced a large increase in regeneration is that from the strip road system of logging jack pine to the so-called mechanical, where the brush is broken up and the soil scarified, thus bringing the seeds to the earth and improving seed bed conditions.

In the case of artificial regeneration by planting or seeding, research has been concentrated on growing more and better seed, extracting coniferous seed from the cone more easily and cheaply, and treating seed to reduce loss from animals, insects and disease. Work has also been done to increase germination and survival of seedlings; for the treatment of seedlings with fungicides and fertilizers; to increase survival and growth; and to improve methods of shade and irrigation.

A series of studies of red pine seed production has been initiated, looking toward annual production of seed in selected areas known as seed orchards. Work is also proceeding on the development of rodent repellents for seeds and a study of the mycorrhizal relationships of various fungi with tree

seedlings is under way. Tests in the nutrient requirements of seedlings is being conducted and a co-operative study in nursery irrigation with very important implications in economy and increased growth is being carried out.

In the case of planting stock, experiments are proceeding with a technique of waxing transplants to reduce loss in dry weather. Experiments are also going on with wider spacing in plantations to extend coverage of nursery stock, to increase growth and reduce the necessity of uneconomic thinnings.

The improvement of trees for specific purposes by genetical selection is under way. The present objective is a blister rust-resistant white pine and a disease-resistant rapid-growing hybrid poplar with light wood colour suitable for pulping.

Under this heading of restoration, research should be carried on to determine the best species and methods of planting rock, shallow soils and scrub land. Therefore this Committee recommends that:

THE PRESENT RESEARCH PROGRAM BE EXPANDED TO
ASCERTAIN THE METHOD AND SPECIES MOST SUITABLE
FOR REFORESTING:

- (1) THE PRECAMBRIAN SHIELD.
- (2) THE LIMESTONE PLAINS.
- (3) MARSHY AND POORLY DRAINED AREAS.

The fisheries research program carried on at South Baymouth and Opeongo Lake and other points in the Province looks toward the determination of populations, the effect of known fishing pressures and the effect of specific environments on species. Some lake bottoms are being mapped with a sonic depth finder to study environmental conditions more precisely. The fisheries research centre at Maple will enable the biologists to reproduce any conditions found in lake or

river in the "artificial lake" which has been built there and study the reaction of the fish. The results will be important in stocking waters with young fish and in other ways.

The Research Division of the Department of Lands and Forests is the principal organization servicing those administrative units having to do with the renewable resources of Ontario other than in agriculture.

Effective management of the resources of this tremendous property in the public interest, including the production of wood, fish, fur and game, the background of the tourist industry, and a significant share in the conservation of soil and water, must be provided to secure a strong and prosperous Ontario. An essential element in securing such effective management is through sound and adequate research.

FISH & WILDLIFE

CHAPTER 36

FISH AND WILDLIFE PROBLEMS

Wildlife is a product of the land and wildlife management is a form of land use. Wildlife is in part the oldest crop of this Province and is still a very important one.

The significance of fish and wildlife to the economy of the Province can be best emphasized by the following table supplied by the Research Council of Ontario.

	<u>Per Cent of Area of the Province</u>
Cleared agricultural land	10%
Forest land	40%
Muskeg rock and inaccessible forest land	30%
Water	20%

This means that at least 90 per cent of the area of the Province will produce fish or wildlife and 50 per cent will produce no other permanent crop.

1. Fish and Wildlife in Agricultural Southern Ontario

There are two main objectives in conserving wildlife, the first is to retain for the citizen of this Province the opportunity to fish and hunt within the law, in an attractive environment, and where possible trap fur for profit. The second is to retain for every citizen the opportunity to see and enjoy the varied forms of birds, mammals and other wildlife of any region in the greatest possible variety.

Land well adapted to wildlife should produce or harbour a permanent population of interesting species and an annual crop of game and fur. These populations should be adapted so that they do not have an adverse effect on farming practices. Farm game species produce the largest crops and are important to the greatest number of people because they are located near large population centres. Their management



Land and water well adapted for wildlife should produce and harbour a permanent population of interesting species and an annual crop of fur.

cutting makes the present forest more suitable for most game species than the mature forests would be. Despite such conditions, most species of game and all species of fur are now greatly reduced in numbers, due to overtrapping and over-hunting in these areas. Present restrictions on trapping and hunting are designed to adjust populations to a more productive figure.

Many submissions were presented on fish and wildlife outlining detailed recommendations specific to local areas. It is the considered opinion of this Committee that owing to the broad nature of our terms of reference, our recommendations must be confined to principles only. It would defeat the purpose of this report to present the multitude of recommendations submitted that apply to local areas only. All submissions on fish and wildlife are being directed to the Standing Committee of the Ontario Legislature on Fish and Game.

Three important problems remain to be overcome. The first is the need for increased research leading to a knowledge of the critical factors controlling fish and wildlife populations; the second is the enormous areas which have to be patrolled by individual Game Overseers; and the third is the fact that there appears to be more hunters, at least of big game, than are consistent with the present supply.

This Committee recognizes that many valuable investigations have been conducted through Government Departments, universities and other organizations created specifically to do research. There is further need, however, for research of a fundamental nature as opposed to applied research. This Committee recommends that:

THE GOVERNMENT SHOULD PROVIDE FOR AN INCREASE IN
FUNDAMENTAL RESEARCH LEADING TO A KNOWLEDGE OF
THE CRITICAL FACTORS CONTROLLING FISH AND WILD-
LIFE POPULATIONS.

When it is realized that the Provincial Government is responsible for the administration of an area of approximately 100,000,000 acres south of the Albany River, and 50,000,000 acres north of this line, the problem of attempting to patrol these enormous areas by game overseers is very great. Present regulations provide that non-resident hunters or fishermen must have a guide during their period of hunting or fishing in the Province.

This Committee recognizes that there are many highly qualified guides that are a credit to their profession. However it appears that there are many cases of inexperienced guides operating in country unfamiliar to them. As an approach to the problem, it is recommended that:

A GUIDES' COURSE SHOULD BE HELD AT THE ONTARIO
FOREST RANGER SCHOOL TO TRAIN AN ADEQUATE NUMBER
OF GUIDES FROM VARIOUS DISTRICTS IN THE PROVINCE.

Such a course ought to establish standards for guiding which would lead ultimately to a Corps of Guides for Ontario. Training should provide for several classes of guides - first class, second class and third class - so that while there would be experienced guides capable of guiding in hazardous country, there would be other guides capable of doing less hazardous work, under the supervision of first-class guides. Considering that in 1948 there were 7,300 licensed guides in the Province, this Committee visualizes that by providing such a guides' course a recognized standard of training would be attained, which would in effect provide an efficient auxiliary type of game warden and overseer. Higher standards for guides would have a far-reaching and beneficial effect on the tourist industry in Ontario.

RECREATION

CHAPTER 37

THE LAND AND RECREATION

Recreation is the pleasurable use of leisure time. It is an essential physical and mental need. Good recreation facilities are now recognized to be as significant in modern life as are good working conditions. Since many types of recreation facilities involve use of the land, recommendations for the proper use and development of recreation resources are a normal part of any conservation plan.

The type of facility which, from the conservation point of view, has been largely ignored and is greatly needed is the public area within a drive of one or two hours at most from the agricultural or urban worker's home. The trend to a five-day working week and longer vacation periods emphasizes the need for the development of recreational areas in Southern Ontario. In the past the planning of recreation facilities in the Province has been chiefly directed towards two ends: facilities such as parks and playgrounds within the boundaries of cities and towns, and facilities for long and comparatively expensive vacations in wilderness regions far from the agricultural and industrial areas of the Province. The time and cost involved in reaching remote areas have prevented the average family or group from visiting such areas more than once or twice a year. Closer accessible facilities such as parks and beaches are therefore greatly needed. South-western Ontario with a population in excess of two million people has access to only three public recreation areas on the Great Lakes - 109 acres at Ipperwash Provincial Park, Lake Huron, 1,500 acres at Rondeau Provincial Park, Lake Erie (both owned by the Province), and Point Pelee Park on Lake Erie, 3,865 acres, owned by the Dominion Government. Submissions state that there is literally standing room only during the holiday weekends at these parks.

The Province has title by The Bed of Navigable



The type of facility which, from the conservation point of view, has been largely ignored, and is greatly needed is the public area within a drive of one or two hours from the agricultural or urban workers' homes. Closer accessible facilities such as parks and beaches are therefore badly needed

Waters Act to the shore lands lying between high water mark and summer water level, which permits limited areas along parts of the Great Lakes and major inland lakes to be used by the public. Such beaches are in no sense suitable public recreation grounds unless contiguous to public lands above high water mark where facilities can be provided for camping, picnicking, dressing and ablution. This is not a small or insignificant problem. More than \$250,000,000 are spent annually on recreation in Ontario, and every sign indicates a rapid future growth. It is therefore important that the remaining natural facilities should be wisely developed and at least a part of them preserved for public use.

Modern conservation measures inevitably involve important changes in the landscape, affecting the river, lakes and woods as well as farming land. Clearly any changes should be adjusted so that the recreation needs of the public are not overlooked. An example of the complexity of recreation planning is its relation to pollution control. This involves not only the control of industrial and human wastes and a supply of clean water for swimming and municipal water supply, but also the management of fisheries, the health of cattle and real estate values. All of these must be kept in mind, and behind all is the factor of permanence of flow, depending on hydraulic improvements and advanced conservation practices. Many other types of recreation facilities involve similar consideration of other conservation practices.

Of the many possible facilities, beaches, picnic sites and roadside parks are normally the most used in Southern Ontario. Scenic drives and facilities for camping and boating, fishing and hunting, skiing and nature study are also important. Even such simple facilities as small swimming holes are fast disappearing in Ontario.

There is no reason why recreation areas should not also be of educational value. For instance, erosion control

demonstrations and other examples of good land practices and good forestry excite general public interest, as do also historic sites. Recreation centres should be planned for and made easily accessible to all residents of the area.

Government Policy with Respect to Crown Lands for Recreation

With most of the Crown lands in Southern Ontario now patented, the setting aside of such lands for public recreational purposes has been made most difficult. When Crown lands fronting lakes do exist it is the policy of the Province since 1947 to retain two lots in ten to be used for recreational purposes. North of the French River, these lots have a frontage of 300 feet, south of the French River, 200 feet.

Although this policy will do little to rectify the problem in Southern Ontario, it will assure in Northern Ontario lands for recreational development on each of the inland lakes. The selection of these lots is vested in the field officers of the Department of Lands and Forests, and this Committee has been assured that these lots reserved for public recreation are the best available for such purposes and are not those that are left over after patents have been taken out by the public.

When many of the townships in the Districts of Muskoka, Parry Sound and Haliburton and in the northern parts of the counties of Peterborough, Lennox & Addington and Hastings were surveyed, an allowance for roads was laid out along all or part of the shorelines of many of the inland lakes and rivers. The "fee" of such allowances is automatically vested in the municipality when organized, which may close up or dispose of this allowance. In most cases, the municipality disposed of this allowance for summer resort purposes and hence precluded the use of these lands for public recreation.

In the chapters on Water, recommendations have been made by this Committee calling for Provincial assistance in the restoration of small dams, and in that connection it is recommended that:

SUITABLE ACREAGES SHOULD BE ACQUIRED BY THE PROVINCE FOR PUBLIC RECREATIONAL USE, FRONTING DAMS AND RESERVOIRS.

Similarly in the chapters on Forestry, it has been suggested that the program of Provincial and Municipal Re-forestation provide lands for recreational use. Such a policy would not only make reasonably available recreational lands for a large section of our urban and rural public, but would be a decided attraction to our expanding tourist industry.

Throughout Southern Ontario there are small lakes on private lands that are suitable for public recreation and which should be made available for such use. It is the opinion of this Committee that the acquisition and management of these sites should devolve on the local municipalities or conservation authority, with financial assistance from the Province.

Considering the dearth of public lands available for recreational use within one or two hours' drive from the major centres of population, and considering that the problem is becoming more complex with expanding population and development, it is recommended that:

THE GOVERNMENT SHOULD FORMULATE A POLICY WITH RESPECT TO ACQUIRING LANDS FOR PUBLIC RECREATIONAL PURPOSES IN SOUTHERN ONTARIO.

In view of the proposed St. Lawrence Seaway and Power project it is specifically recommended that:

THE GOVERNMENT ACQUIRE SUFFICIENT LANDS FRONTING THE PROPOSED ST. LAWRENCE RESERVOIRS TO BE USED FOR PUBLIC RECREATION.

EDUCATION

CHAPTER 38

CONSERVATION AND EDUCATION

In the words of Dr. Hugh Bennett, Chief of the United States Soil Conservation Service:

"Education is a prerequisite of conservation. It is essential to develop an intelligent public understanding of the value and importance of natural resources in terms of individual and national life. Only out of such an understanding will the impetus to act arise".¹

What is meant by education for conservation? E. C. Hollinger gives the following definition:

"All the processes adopted to adjust the attitudes, develop the understanding, increase the abilities, and stimulate action in accomplishing and maintaining conservation".²

If a long-range conservation program in Ontario is to succeed, education must play an active and important part. It can assist the whole community, and particularly children and young people, to understand the problem and to co-operate voluntarily in making the program effective. If every trustee, every teacher and every child at school became an ardent conservationist, the program could not fail.

Among the objectives of education in Ontario must be these:

(1) Every child should grow up with a lively awareness of our natural resources, their value and their relation to "life, liberty and the pursuit of happiness". The attitude that our soil, water and wood resources "just happen to be here", or can be taken for granted, is an attitude not compatible with good citizenship.

(2) The myth that Canada is a land of unlimited and

1. Bennett: Soil Conservation, p. 317.

2. Journal of Soil and Water Conservation, October, 1949, p. 137.

inexhaustible resources must be exploded. For this great illusion politicians are probably even more responsible than school-teachers. We know better now and the people, both young and old, must be given the truth. It is indeed true that Canada, with its resources, is among the most fortunate countries, and Ontario is one of the most richly endowed provinces. It is also true, however, that most of our resources can speedily be dissipated unless wisely used and protected. They are not unlimited; they are not inexhaustible.

(3) Every child should learn the basic principles of conservation as revealed by modern science and modern farming. There is much more to this than "nature study", but it does not mean becoming an expert or specialist. Education can show how most of our resources will reproduce or rebuild themselves if given a fair chance to do so, and that in this process man can gain more by co-operating with nature than by waste or destruction. Education can also kindle a continuing interest and provide a background for understanding the wealth of new information which science will surely disclose in years to come.

In other words, education must struggle to counteract the mistaken attitudes which are implanted by the habits of the past, and at the same time strive to replace them constructively with the correct attitudes. E.D. Hollinger states the magnitude of this problem as follows:

"Conservation as a way of life involves a new and different concept for most of us. Our training and habits of thinking have not generally been in line with conservation. Our physical sciences, our history and other social sciences, and our fiction and other literature reflect the idea of conquest and subjugation of the land and exploiting and often wasting our resources.

"Our whole social, economic, educational and governmental structures were developed with little or no regard for conservation. Some of the laws, the taxation, the literature, the unwritten traditions, and in some cases the land tenure pattern and public policies have offered resistance to full conservation. To overcome these influences we must make known conservation as a world-wide human problem and a challenge to all of society and to each of its individuals".

In the broadest sense, education includes adults as well as children. Its techniques are ever widening, and among the most effective now are the radio and the motion picture as well as the printed word. Through these media it is possible to reach the general public. The effort to create public understanding should not be confined to the schools, nor should it be left entirely to voluntary effort, although good work has already been done by many publications, groups and individuals.

Excellent literature relating to conservation has been issued by several Departments of the Ontario Government, some of which should be given wider distribution. Most of it, however, is designed for adult reading. Different techniques are required in appealing to the interest of children. Children are capable of sustained interest in this topic if it is presented in simple language and pictorial form. Conservation literature for children of all grades is already available in the United States and is being used by schools. In Ontario the appropriate Departments should publish booklets for children as well as adults. This Committee recommends:

THAT THE PUBLICATION AND DISTRIBUTION OF EDUCATIONAL LITERATURE - FOR CHILDREN AS WELL AS ADULTS - SHOULD BE CONTINUED AND THAT MORE USE SHOULD BE MADE OF RADIO BROADCASTS AND MOTION PICTURES FOR CONSERVATION PURPOSES.

For the people closest to the land, farmers and their families, education is closely linked to the extension work of the Department of Agriculture, which is discussed elsewhere in this report. Certain agricultural demonstrations are of wide interest and have educational value to the general public.

An outstanding example is the demonstration field on No. 7 Highway, near New Hamburg. Here a series of run-off

plots show clearly how much soil and water are lost from a bare or intertilled slope, and how much less is lost from grass or when cultivation is across the slope, such as on the contour. Any passer-by, stopping for a few minutes, can observe and understand this convincing demonstration. This Committee recommends:

THAT EVERY ENCOURAGEMENT SHOULD BE GIVEN TO THE ESTABLISHMENT OF RUN-OFF DEMONSTRATION PLOTS AT SUITABLE LOCATIONS THROUGHOUT ONTARIO.

Run-off plots show the need to conserve precious topsoil and how quickly it can be lost. Something equally graphic is needed to remind us of the need for conserving water and wood.

Notwithstanding the fact that summer water shortages have become chronic in many urban municipalities, we continue to use - and waste - water at a rate unknown in older countries. Our city dwellers expend about three times as much per capita as the residents of London, England. During the recent winter water crisis in New York City, it was found that over 100,000,000 gallons a day were being lost from leaky taps alone, and all water wasted amounted to about 37 per cent, or more than 400,000,000 gallons a day. It would be idle to deny that similar conditions prevail in our own cities and towns.

We must learn that water is a valuable commodity. For many localities it is already in short supply. The installation of new pumping systems is very costly and will add to the tax burden. We must repent and discard our present casual attitude towards water. The municipalities should do their utmost to publicize the facts of this growing problem. A continuing educational campaign might well be more effective than drastic reductions suddenly imposed in time of crisis.

A perennial problem of forestry is the man-made fire. Most forest fires result from human negligence. It is fair to

conclude that there would be very few fires if every citizen and visitor fully appreciated the enormous value of our forest resources to this and coming generations. This Committee therefore recommends:

THAT THE DEPARTMENT OF LANDS AND FORESTS SHOULD INTENSIFY ITS CAMPAIGN AGAINST CARELESSNESS IN THE WOODS AND THAT OTHER DEPARTMENTS SUCH AS HIGHWAYS AND EDUCATION AS WELL AS TRAVEL AND PUBLICITY SHOULD BE ASKED TO CO-OPERATE MOST VIGOROUSLY TO THE SAME END.

CONSERVATION AND THE SCHOOLS

Conservation or the lack of it results from the attitude of human beings toward their natural environment. It may be wise, far-sighted and co-operative, or it may be wasteful and destructive. Obviously this attitude - either the former or the latter - may be formed very early in life. Dr. Hugh Bennett has this to say about the schools:

"We cannot be assured of the permanency of our soil conservation work until the concept of its absolute necessity sinks deeply and fixedly into our psychological make-up. The one best way to get this into our national habits is to start early in our schools, in order to plant the ideas deeply and firmly in the minds of our children. We must get it into our very blood stream, so that soil conservation - so vital to national and world prosperity, happiness and health - becomes a part of our national culture as a fixed national objective".

It is not suggested that the curricula of Ontario schools be drastically re-organized to teach conservation. It is apparent however that more emphasis should be given to both the theoretical and the practical aspects of the subject.

Although "conservation" is not listed as a specific topic at present for Grades I to VI, elementary teaching of the modern approach could be introduced into the course in "Natural Science". The Grade VII course in "Social Studies" includes a topic known as "Conservation of Fish and Forest Wealth". The Grade VIII Science course lists water and drainage as topics.

In secondary schools five periods are assigned to Conservation in the course known as "General Science" and "Agricultural Science". Through the schools there has also been some circulation of literature and films relating to conservation. Seven new film titles on conservation of natural resources have been added to the Audio Visual Education Branch of the Ontario Department of Education in the past few months.

Certain schools have sponsored tree-planting projects with the help of personnel from the Department of Lands and Forests. Such efforts, however, may be described as sporadic. Where they exist, they have value, but it is important that children should not be given the impression conservation begins and ends with the planting of trees. Actually, an intelligent interest in the soil, our basic resource, is the prior need.

Undoubtedly the Department of Education and many teachers desire to give conservation more emphasis. The results are not yet apparent. At hearings held by this Committee a frequent suggestion from witnesses was that the subject should be taught in all grades of school. Rightly or wrongly, many interested parents feel that conservation is receiving little or no attention in the schools at present.

Conservation is one of the newest sciences and yet one of the oldest. Some of its principles were taught and observed in ancient times, but in our lifetime the collection of facts and principles has caused it to become recognized as a definite science. Most important discoveries have only come in recent years. It was not until about 1934 that the United States awoke to find that more than half its farm land had been eroded and was rapidly becoming non-productive. Sociologists are just beginning to point out that erosion has often played a more decisive part in history than wars or revolutions. The science of soil conservation is closely entwined with various other physical, biological and social sciences as well as with the agricultural sciences which have made tremendous strides in the last decade.

As these are recent developments it is perhaps not surprising that the Ontario Public School Geography, in use for many years, does nothing to teach conservation. The reader is given the impression that Canada's resources of field and forest are immense, but the possible exhaustion of soil fertility is not mentioned, and the depletion of forest

wealth is scarcely noticed. Books like these should be replaced by a modern presentation of geography. Since the Committee was appointed the authorization of this geography text book has been cancelled. The newer books which will replace it all devote a good deal of attention to conservation.

Similarly, the teaching of history should be more closely related to the story of man's use and abuse of his natural environment. Too many historians have been pre-occupied with the rise and fall of political and military figures, failing to mention, for example, that ancient cities like Antioch and Ur of the Chaldees were ruined by drifting sand and unsound agricultural practices rather than by foreign invaders. Children should learn that the valley of the Tigris and the Euphrates at one time supported ten times as many people as today, and that this change was due not to war but to deforestation, flooding and soil erosion.

No doubt school curricula are already crowded with important subjects, but the future welfare of society depends so much on Conservation that it must receive more attention than at present. Apart from its economic importance, conservation properly taught will contribute to the building of character and good citizenship.

Many of the present courses could be taught with due regard for conservation principles. Indeed, such principles should pervade the whole educational process. E. C. Hollinger says that "the beginning of conservation must generally be a change of attitudes". No change would be necessary if children started life with the correct attitude toward their heritage of natural resources.

The increase in emphasis on conservation is needed in urban as well as in rural schools. Conservation is not merely the responsibility of farmers and landowners. It must be recognized as a responsibility of all citizens. This Committee recommends:

GREATER EMPHASIS SHOULD BE GIVEN TO THE TEACHING OF CONSERVATION IN BOTH ELEMENTARY AND SECONDARY SCHOOLS, BOTH RURAL AND URBAN.

Obviously much depends on the teaching profession. It would be difficult to exaggerate the influence teachers could have on the viewpoint of our citizens-to-be with respect to conservation. Many teachers already take an active interest in the subject and their efforts are to be commended. There is danger, however, that others will lack interest or feel they are not qualified to teach conservation unless more emphatic attention is given the subject in the normal schools and in the universities. At present conservation does appear in the normal schools' course on Science and Agriculture. Certain forestry and garden projects are also being sponsored by some of the normal schools. This is all to the good and a further effort should be made to impress all teachers-in-training with the importance of their role in the conservation program.

The subject concerns both secondary schools and elementary schools and impinges on subjects other than the sciences. It follows that the Ontario College of Education and universities giving teacher-specialist courses should review their curricula in the light of conservation principles.

Certain departments of the universities have done pioneer work in the science of conservation. It may well be asked, however, whether students in such diverse subjects as engineering and history are aroused to the importance of conservation and its significance for their own professions. Yet the engineer in his own sphere, and the history teacher in a very different sphere will both need a knowledge and understanding of geography and conservation not thought of by their predecessors. This Committee recommends that:

THE NORMAL SCHOOLS, THE COLLEGE OF EDUCATION AND THE UNIVERSITIES OF ONTARIO SHOULD BE ASKED TO CONSIDER WHETHER THEIR CURRICULA GIVE DUE REGARD TO THE

IMPORTANCE OF CONSERVATION, BOTH AS A SCIENCE AND
IN ITS BEARING UPON OTHER SUBJECTS.

CONSERVATION AUTHORITIES

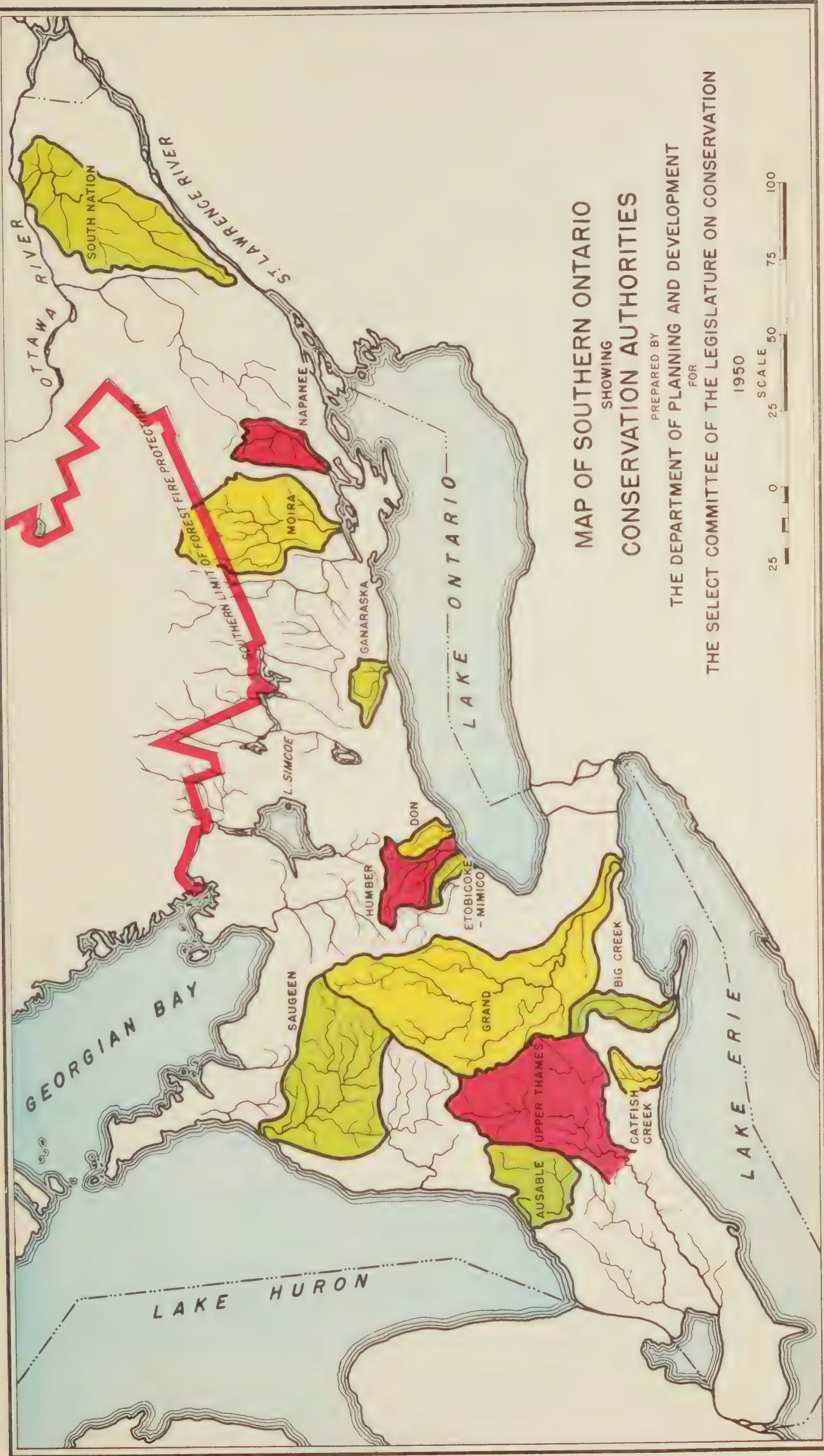
CHAPTER 40

THE RIVER VALLEY AUTHORITIES

The Conservation Authority movement had its beginning in the desire of several groups to accelerate conservation work throughout the Province. They urged as a fresh approach that the initiative for such work be vested in the municipalities within a watershed drained by a river and its tributaries. On April 25, 1941, a conference was held at the Ontario Agricultural College, Guelph, with representatives from the following organizations interested in conservation: The Ontario Conservation and Reforestation Association, the Federation of Ontario Naturalists, the Ontario Federation of Anglers and Hunters, the Southern Ontario Section of the Canadian Society of Forest Engineers, the Canadian Society of Technical Agriculturists, The Canadian Conservation Association, the Canadian Legion, the Men of the Trees and The Royal Canadian Institute.

The most important achievement of the Guelph Conference was the initiating of the Ganaraska Survey, undertaken jointly by the Dominion Government (represented by the Advisory Committee on Reconstruction) and the Ontario Government (represented by the Interdepartmental Committee on Conservation and Rehabilitation). A recommendation of the Ganaraska Report was that legislation be enacted which would provide for the carrying out of conservation work on the basis of a river valley under the supervision of the municipalities within that valley. In 1944 the Conservation Branch was established in the Department of Planning and Development, and in 1946 the Conservation Authorities Act, which is administered by that Branch, was passed.

Under this Act two or more municipalities wholly or partly within a watershed may petition the Government for establishing an Authority. All municipalities within the area are notified and two-thirds of these must be represented to



MAP OF SOUTHERN ONTARIO
SHOWING
CONSERVATION AUTHORITIES

PREPARED BY
THE DEPARTMENT OF PLANNING AND DEVELOPMENT
FOR

THE SELECT COMMITTEE OF THE LEGISLATURE ON CONSERVATION

1950



form a quorum. If two-thirds of the delegates present vote in the affirmative then the Authority is established by Order-in-Council and all municipalities, whether they were represented or not, are part of the body corporate.

While most Authorities were brought into being because of the urgent necessity to correct flooding within their areas, all were aware of the necessity of carrying out supplementary measures such as improved methods of land use, re-forestation, proper woodlot management, prevention of pollution, underground water supplies, wildlife studies and recreation.

But while there was sincere appreciation of the need of such works being undertaken within their boundaries, the Authorities were not equipped to carry out extensive investigations which would indicate where such work should be done and the sequence of carrying it out. Consequently the Conservation Branch of the Department of Planning and Development undertook such work as a service to the Authorities, and by means of surveys and reports appraise the conservation needs of each watershed and submit a report to the Authority in which the conservation measures which should be undertaken are set forth in detail.

The reports when presented are intended to serve as a blueprint by which the Authority can get on with its job. But the carrying out of these recommendations is definitely the work of the Authority. It must initiate the schemes which it considers most urgent and make the approaches to the Government Departments or other bodies from which it hopes to get assistance. If a scheme undertaken by an Authority has to do with soils or land use, it must seek assistance from the Department of Agriculture; if it is a forestry or wildlife problem then from the Department of Lands and Forests. However, in the case of flood control, as there is no Department of the Government doing hydraulic surveys except the Conservation Branch of the Department of Planning and Development,

whose staff is not big enough to carry through the engineering works of several Authorities, the Authority must engage a consulting engineer, approved by this Department, to do the final engineering and designing for hydraulic projects and carry the work through the construction stage. Similarly, where an Authority undertakes a scheme which has to do with recreation, special men trained in this work must be employed by the Authority.

As the work being done by Authorities is a new approach to the conservation problem in that the responsibility of carrying it out is left largely in the hands of the Authority, much directing and assistance have been necessary from the Conservation Branch. In the case of the Thames Authority, which is most active, an employee of the Branch has been attached permanently to it, who acts as a secretarial manager for the Authority and provides a liaison between the Authority and the different Departments of Government in executing their conservation program.

Since the Act was passed in 1946, the following Authorities have been established. These include 10,014 square miles in Southern Ontario with 246 participating municipalities: Ausable, Big Creek, Catfish Creek, Don, Etobicoke, Ganaraska, Grand, Humber, Mimico (joined to Etobicoke), Moira, Napanee, Saugeen, South Nation and Upper Thames.

Works already completed or now under way by Authorities include the reforestation of 20,000 acres of submarginal land on the Ganaraska, 1,300 acres of which have been planted to date, and 1,633 acres on the Upper Thames; flood control schemes on the Etobicoke for the Village of Long Branch and the Town of Brampton; flood control on the Thames at Ingersoll and on the Ausable at Port Franks.

In addition, plans have been completed for a reservoir at Glen Allan on the Grand; at Wildwood and Glengowan on the Thames; at Spencerville and Domville on the South

Nation; and a multiple use conservation scheme on the Humber. Engineering now in progress includes a dam at Luther Marsh on the Grand; a dam at Fanshawe and corrective work at Mitchell on the Thames; a dam at Second Depot Lake on the Napanee; and two dams and other corrective measures on the South Nation. A summary of works in progress, or completed, is given at the end of this chapter.

Many Conservation Authorities, including the Moira, South Nation, Ausable, Grand and Don will soon become more active, and will require the full time services of a Conservationist, such as is employed by the Thames Authority. This Committee therefore recommends that:

THE WORK OF CONSERVATION AUTHORITIES SHOULD BE ACCELERATED BY APPOINTMENT OF CO-ORDINATING OFFICERS, AS HAS BEEN DONE ON THE UPIER THAMES AUTHORITY TO INTEGRATE THE BROAD FIELDS OF CONSERVATION FOR THE AREA AND ACT AS A LIAISON BETWEEN THE AUTHORITY AND THE DIFFERENT DEPARTMENTS OF THE GOVERNMENT IN CARRYING OUT CONSERVATION PROGRAMS.

Submissions presented to this Committee indicate that Conservation Authorities should be empowered to assess not only municipalities which receive direct benefit, but also those municipalities which receive indirect benefit from any program undertaken by the Authority. It is therefore recommended that:

THE CONSERVATION AUTHORITIES ACT, 1946, SHOULD BE AMENDED TO PROVIDE FOR THE RAISING OF MONEY FROM MUNICIPALITIES RECEIVING EITHER DIRECT BENEFIT OR INDIRECT BENEFIT FROM ANY WORKS UNDERTAKEN BY AN AUTHORITY.

Due to the fact that some municipalities are partly within a watershed on which an Authority has been established, and that under the present statute the Authority's assessment to this municipality must be raised from the entire municipality, it is further recommended that:

THE CONSERVATION AUTHORITIES ACT SHOULD BE AMENDED TO PERMIT BENEFITTING MUNICIPALITIES TO RAISE THEIR PORTION OF THE AUTHORITY'S ASSESSMENT FOR A PROGRAM FROM THOSE LANDS OF THE MUNICIPALITY WITHIN THE WATERSHED WHICH ACTUALLY BENEFIT FROM THE PROGRAM.

The responsibility for financing a conservation program merits examination. Obviously it cannot be borne entirely by the individual or municipality because of their inability to pay the entire cost of expensive schemes, conversely not entirely by the State as this would foster an attitude of extreme paternalism. The answer lies somewhere in between. In the case of reforestation for Authorities, a precedent has already been established by which the Authority purchases approved reforestation land for which the Government pays one-half the cost, after which the planting and management of the area are carried on for approximately 50 years under agreement by the Department of Lands and Forests.

The formula which has been adopted for Conservation Authority flood control schemes goes back to the building of the Shand Dam on the Grand River (1939-1942), when the benefitting eight urban municipalities contributed 25 per cent of the cost, the Ontario Government $37\frac{1}{2}$ per cent, and the Federal Government $37\frac{1}{2}$ per cent. This same formula has been proposed for subsequent flood control works, but up to the present the Federal Government has not acceded to the request for financial help from any of the Authorities.

Moreover, while the 25-75 per cent ratio appears to be an equitable one as between the Authority and the two Governments in most cases, it appears to this Committee that the ratio is not equitable where a group of rural municipalities alone are engaged in carrying out a large flood control program. Where such schemes are designed primarily for the protection of urban centres, especially large cities, the population is so dense and the assessment is so great that the

cost to the individual does not become a burden. However, when such costs are allocated to farmland the individual assessment becomes so heavy that even if it were spread over a period of many years by debentures the amount involved for each farmer might amount to a large proportion of the value of his farm. This Committee therefore recommends that:

THE POLICY OF THE GOVERNMENT IN FINANCING WORK OF CONSERVATION AUTHORITIES SHOULD BE BROADENED AS FOLLOWS: (1) TO ALLOW FOR LARGER GRANTS FOR FLOOD CONTROL SCHEMES WHERE THE BENEFITTING MUNICIPALITIES ARE FOR THE MOST PART RURAL. (2) TO ALLOW FOR A SUBSTANTIAL GRANT TOWARDS THE COST OF ENGINEERING, SO THAT AUTHORITIES MAY BUILD UP A BACKLOG OF SCHEMES FOR FUTURE ACTIVITY IF AND WHEN THE ECONOMIC SITUATION IN THE PROVINCE REQUIRES IT.

WORKS BY AUTHORITIES COMPLETED OR IN PROGRESS

Authority	Name of Project	Cost of Engineering	Cost of Construction	Total Cost	Remarks
AUSABLE	Port Franks Improvement		117,800	117,800	Work in progress
ETOHICKE	Long Branch Flood Control Brampton Flood Control		86,000 750,000	86,000 750,000	Work completed Work in progress
GALABASKA	Reforestation		17,000 per annum	17,000 per annum	Work completed for 1949
GRAND *	Conestogo Dam Luther Dam	7,500	3,812,000	3,812,000	Plans completed Survey in progress
NAPANEE	Second Depot Lake Dam and Reservoir	7,500			Survey in progress
SOUTH NATION	Spencerville Dam and Reservoir Domville Dam and Reservoir Diversion Canal Spencerville Mill Dam and Reservoir Hyndman Dam River Regrading	11,000 3,830 21,570 2,400 3,000 11,000	234,000 39,400 1,200,000 58,600 41,700 639,000	245,000 43,230 1,221,570 61,000 44,700 650,000	Plans completed Plans completed Survey in progress Survey in progress Survey in progress Survey in progress
UPPER THAMES	Wildwood Dam and Reservoir Glengowan Dam and Reservoir Mitchell Channel Improvement Mitchell-Motherwell Survey Fanshawe Dam and Reservoir Ingersoll Flood Control	8,470 20,458 1,398 2,300 85,662	550,000 2,500,000 200,000 900,000	558,470 2,520,458 201,398 900,000	Plans completed Plans completed Plans completed Survey in progress Survey in progress Construction in progress
Totals		136,068	11,145,500	11,228,626	

* Grand River Conservation Commission

DOMINION-PROVINCIAL RESPONSIBILITIES

CHAPTER 41

FIELDS OF CO-OPERATION

Dominion-Provincial responsibilities in financing conservation programs is by no means a new field to be explored, for already there exist many precedents where the Dominion Government has assisted the Provinces, both financially and technically, on many phases of land rehabilitation and water conservation projects, some of which will be briefly reviewed.

This Committee has observed with satisfaction that there exist close co-operative working arrangements between the personnel of Federal and Provincial Departments of Government, and contrary to the general belief there is not the extent of duplication that opinions expressed in some briefs would seem to indicate.

One of the earliest joint Dominion-Provincial projects related to soil conservation is that pertaining to the Ontario Soils Survey, whereby the Experimental Farms Branch of the Dominion Department of Agriculture, in co-operation with the Soils Department of the Ontario Agricultural College, is bearing approximately 50 per cent of the cost of this work, including the publishing of the report. This is fundamental data which must precede any land use program.

In previous chapters, reference has been made to the sharing of costs of the Shand Dam on the Grand River in the ratio of 25 per cent by the directly benefitting municipalities, 37½ per cent by the Ontario Government and 37½ per cent by the Dominion Government.

As an illustration of Federal-Provincial participation in forest research, there has been established at Sault Ste. Marie a forest entomology laboratory, the costs of which are shared between the Dominion Department of Agriculture and the Ontario Department of Lands and Forests.

Economic land use studies have been conducted jointly by the Economics Division of the Dominion Department of Agriculture and Departments of the Ontario Government.

Much more significant responsibility was assumed by the Dominion Government with respect to the Prairie Provinces. In 1935 the Dominion Parliament passed the Prairie Farm Rehabilitation Act, the purpose of which is "to secure the rehabilitation of the drought and soil-drifting areas of the Provinces of Manitoba, Saskatchewan and Alberta, and to develop and promote within these areas systems of farm practice, tree culture, water supply, land utilization and land settlement that will afford greater economic security". To this end the Dominion Minister of Agriculture, in whom the administration of this Act is vested, is empowered to "undertake the development, construction, promotion, operation and maintenance of any project or scheme under or by virtue of this Act, or enter into agreements with any province, municipality or person with respect thereto".

This Act was brought into force to deal with a crisis of national importance created by the adverse effects of low grain prices and low yields due to drought and soil drifting.

In the Maritimes, the Federal Government is participating in land rehabilitation through its recently enacted Maritime Marshland Rehabilitation Act. The marshlands of the Bay of Fundy, built up by the extremely high tides of that body of water, are the scene of land reclamation work begun some three centuries ago. With an area of between 80,000 and 100,000 acres, these marshlands constituted the most fertile land resources of the Provinces of Nova Scotia and New Brunswick. In recent years many of the dikes have fallen into disrepair, production has declined and much excellent land has "gone out to sea". In 1944 the Dominion Government commenced an emergency dikeland repair program conducted on a three-way

basis including landowners, provincial governments and the Government of Canada. This culminated in 1948 with the passing of the Maritime Marshland Rehabilitation Act. This Act is similar to the P.F.R.A., differing mainly in that it specifically requires provincial participation.

The Canada Forestry Act was passed by the House of Commons, November 30, 1949. It empowers the Federal Government to enter into agreements with any province for "the protection, development or utilization of forest resources, including protection from fire, insects and diseases, forest inventories, silvicultural research, watershed protection, reforestation, forest publicity and education, construction of roads and improvement of streams in forest areas, improvement of growing conditions and management of forests for continuous production". The Act further provides for the Federal Government to enter into agreements with any province, arrangements with departments or agencies of the Government of Canada, and agreements with any persons, for carrying out the purposes and provisions of the Act.

The above specific examples, drawn from many which might be quoted, are an indication of the Dominion Government's recognized responsibility in the field of conservation in the provinces, and the Canada Forestry Act presupposes more extensive participation in the future.

This Committee recommends that:

THERE SHOULD BE PROVINCIAL-FEDERAL AGREEMENTS WITH RESPECT TO FINANCING AND PARTICIPATION IN THE FOLLOWING TYPES OF CONSERVATION PROJECTS:

(a) State Forests

This Committee is strongly of the opinion that in reclaiming land that is burnt over, waste or submarginal by restoring tree growth to these great areas in our Province, the rehabilitation that results has an effect on our national

economy and consequently becomes, in our judgment, a sharing responsibility insofar as costs are concerned.

(b) Flood Control Reservoirs

The argument can be applied to the building of large dams, in which there is already a precedent of Federal participation. The flood damage to many urban centres and large tracts of farmland is tremendous. The loss to both agriculture and industry from flood damage is automatically reflected in our national economy. To provide protection for these areas is a financial undertaking which the Province and municipalities are unable to bear alone. This becomes a task of rehabilitation and reclamation in which provincial and national interests are clearly involved and there should therefore be a sharing of costs on projects of this character.

(c) Lakeshore Erosion

Lakeshore erosion represents an annual loss of land from the nation which cannot be reclaimed. The fundamental knowledge necessary for efficient shore erosion control commences with a study of lake currents and their effects on shore erosion, which study is clearly a Federal responsibility. Already the Federal Government has acknowledged a responsibility in participating in shore erosion control measures through its Maritime Marshland Rehabilitation Act. This Act is predicated on the rehabilitation and reclamation of land for agricultural purposes, whereas the problem in Ontario is one of prevention and control.

PROVINCIAL ADMINISTRATION

CHAPTER 42

ADMINISTERING THE PROGRAM

One of the most difficult of all questions arising in connection with a conservation program is the question of administration. The subject is far-reaching and extends along many fronts and at all levels of responsibility, both public and private. The result is that almost every Department of Government - Federal, Provincial and Municipal - has a certain degree of responsibility although some are undoubtedly more directly involved than others.

In view of the Canadian Constitution, which vests control of natural resources in the Province, it is obvious that the provincial role must be one of great importance. On studying the structure of provincial administration it soon becomes clear that three Departments in particular have necessarily become concerned in a large way with conservation matters, namely, Agriculture, Lands and Forests, Planning and Development. These might be described as the "major" Departments from a conservation point of view. They have many opportunities to give leadership and guidance and their influence can hardly be overestimated. Agriculture is in touch with the farming population through countless activities. Lands and Forests is actually charged with the administration of a vast empire comprising about 85 per cent of the land area of Ontario as well as with forest management and tree-planting. Planning and Development has functions of a different kind which are particularly significant in relation to rivers, watersheds, and conservation survey work generally.

It is also important to note that the three major Departments are constantly called upon to co-operate with local bodies of many kinds for conservation purposes, for

example, in field demonstration days, tree planting projects and the like, and co-operation with Conservation Authorities. The development of this liaison between provincial authorities and local groups is of the highest importance to the success of a conservation program.

Apart from the three which have been described as "major" Departments for conservation purposes, it is clear that most of the others are also involved. On reflection it will be noticed that the Departments of Highways, Public Works, Health, Mines, Education and others, as well as the Hydro Electric Power Commission, and the Ontario Northland Railway are directly or indirectly involved in matters relating to conservation.

The very fact that so many different Departments and Agencies are necessarily concerned with conservation creates a problem. If there is to be a policy or program it must be administered not by one Department but by many. There is an old saying that "everybody's business is nobody's business". Even with the best of intentions on the part of all concerned, a policy or program can hardly succeed without a high degree of integration and co-ordination.

It is sometimes suggested that a new Department or Commission should be set up to supervise and co-ordinate the conservation program. After careful consideration, this Committee is satisfied that a new Department or Commission would not be a satisfactory solution.

No matter how broad the powers of a new agency might be in theory, it would still be a fact that major Departments of Government necessarily become involved in conservation matters every day of the year.

Secondly, it is asking the impossible to expect that a new and very junior Department can exercise sufficient influence to co-ordinate the work of much older, much larger Departments which already have widespread contacts and traditions in almost every locality of the Province, as indeed they

should have.

Thirdly, the success of a conservation program depends on the co-operation of a large number of citizens. This Committee believes that their co-operation and support can be enlisted more effectively through existing Departments and through public servants who are already well known in the areas they serve than through any new Department or Commission. It is believed that the creation of a new Agency, which might appear to duplicate or compete with work already under way, would not be favourably received by the public and might actually alienate some of the support which is greatly needed.

For the foregoing reasons and others the Committee cannot recommend the creation of a new Department or Commission. This is not to overlook the importance of conservation, but rather emphasizes its comprehensive scope and deep importance. Such high matters of policy undoubtedly call for integration and co-ordination, for a policy or program, both short-range and long-range. A patchwork series of improvisations would not meet the need. This Committee wishes to emphasize that there must be integration and co-ordination under an overall program. The question remains: How is it to be achieved?

After careful inquiry and thought, this Committee has come to the conclusion that only one Department of Government is capable of exercising that degree of influence and authority necessary to assure the co-ordination and integration of a program whose ramifications extend into almost every Department and Agency of Government. That one Department having the requisite authority is the Department of the Prime Minister. It would do much to assure success if the Prime Minister himself accepted leadership in relation to overall policy. Policy after all will inevitably be wider than the field of any one Department.

To be effective, policy must be implemented. Here the responsibility will fall on many different Departments. However:

further to assure co-ordination and to encourage continuous co-operation between the public servants of various Departments, this Committee believes there should be a Chief of Conservation attached to the Prime Minister's Department. He should have the status of a Deputy Minister and be responsible to the Prime Minister. It goes without saying that he should be a conservationist of distinction and ability.

A third necessity is the creation of an Inter-departmental Committee. Each Department concerned would be represented on this Committee by a Deputy Minister or other senior official designated by the Minister. The Chief of Conservation would be Chairman of the Inter-departmental Committee and his leadership would protect it against the disintegration which often afflicts committees composed of very busy men. It would be the duty of the Committee to review and supervise the work of all Departments relating to conservation at the public service level, and, in a larger sense, to make certain that policy decisions are duly implemented.

Certain conservation measures, both present and proposed, entail the expenditure of public funds. Because so many different Departments are concerned, these expenditures in the ordinary course would appear under Departmental headings, scattered through the Estimates and the Public Accounts. Thus it becomes impossible to view such expenditures as a whole, or to consider them in relation to the conservation program as a whole. Moreover, appropriations made for the purposes of a Department have a tendency to re-appear in the Estimates of that Department year after year. This Committee is therefore of the opinion that there would be great advantages in consolidating all estimates necessary to carry out the Conservation Program under the heading of the Prime Minister's Department, even though the actual disbursement of funds would subsequently be made through the appropriate Department in the field. The Committee is satisfied, after inquiry, that such an arrangement is feasible from a legal and accounting point of view.

It would enable the Legislature each year in Committee of Supply to consider the costs of Conservation at one time, namely, while dealing with the Estimates for the Prime Minister's Department.

It is also suggested that provision should be made for an annual review of the program by the peoples' elected representatives through a Standing Committee of the Legislature. Undoubtedly many matters raised by local and provincial organizations could usefully be discussed by such a Committee, and it would afford an annual opportunity to the Chief of Conservation to report on his work and to discuss the program fully with members of the Legislature.

The Committee believes that the structure of administration which has been outlined would be more effective and efficient and would also be much less costly than any administrative alternative which might be suggested. It corresponds with the realities of the situation - which are: That conservation work must be done in many different Departments and at many different levels, while at the same time the integration and co-ordination of both policy and practice is absolutely essential.

For the foregoing reasons, it is recommended that:

THE DEPARTMENT OF THE PRIME MINISTER SHOULD BE VESTED WITH RESPONSIBILITY FOR THE OVERALL POLICY AND PROGRAM OF CONSERVATION IN ONTARIO.

FOR PURPOSES OF ADMINISTRATION THE PRIME MINISTER SHOULD APPOINT A CHIEF OF CONSERVATION, HAVING THE STATUS OF A DEPUTY MINISTER, WHOSE DUTY IT WOULD BE TO BRING ABOUT CO-ORDINATION AND CO-OPERATION OF ALL INTERESTED DEPARTMENTS AND AGENCIES IN MATTERS RELATING TO CONSERVATION.

AN INTER-DEPARTMENTAL CONSERVATION COMMITTEE SHOULD BE ESTABLISHED WITH THE CHIEF OF CONSERVATION AS CHAIRMAN, EACH DEPARTMENT CONCERNED TO BE REPRESENTED BY THE DEPUTY

MINISTER OR OTHER SENIOR OFFICIAL DESIGNATED BY THE
MINISTER.

ESTIMATES REQUIRED TO IMPLEMENT A CONSERVATION PROGRAM
SHOULD BE CONSOLIDATED UNDER THE PRIME MINISTER'S
DEPARTMENT, AND THE FUNDS DISBURSED BY THE APPROPRIATE
DEPARTMENT IN THE FIELD.

AT EACH SESSION OF THE LEGISLATURE A STANDING COMMITTEE
ON CONSERVATION SHOULD BE APPOINTED TO REVIEW THE
PROGRAM AND WORK OF THE YEAR.

MISCELLANEOUS

CHAPTER 43

RESEARCH IN LIGNITE

For some years there was considerable interest in Northern Ontario deposits of lignite. It will be recalled that in 1944 a Select Committee of the Legislature investigated the matter and reported in 1945 that the development of the lignite deposit at Onakawana was not economically sound.

Previous inquiries have related to the use of lignite as fuel. On that question this Committee does not presume to make any comment.

It has been brought to the attention of the Committee, however, that certain developments are now under way in the United States which suggest that inquiry ought to be made into the possibility of using lignite as a base or filler for fertilizer.

Commercial fertilizers at present are distributed with a filler, frequently sand, which is of little or no value to the soil. Certain interests in the United States are experimenting with processed low-grade coal as a filler. It is said that such low-grade coal contains many impurities, including certain minerals and trace elements which detract from its value as a fuel, but which, it is suggested, can be of actual benefit to soils deficient in the trace elements as many soils are.

Coal and the multitudinous products derived from coal play an important part in chemical processes which are not yet fully understood. Some scientists suspect that coal dust in association with the principal constituents of fertilizer - nitrogen, phosphorous and potash - will set in motion beneficial reactions or release nutrient values which might otherwise remain locked up.

This Committee is not prepared to vouch for any theory or to predict that the U. S. experiments with coal will succeed. It does appear, however, having regard to the large deposits of lignite in Northern Ontario, that the subject is well worth exploring here. Fertilizer is of great importance to agriculture and the whole cause of conservation.

The possibility of developing our lignite resources, with advantage to the North as well as to Southern Ontario, cannot be overlooked. Without in any way passing judgment, it can at least be said that the matter merits research.

AGRICULTURAL ENGINEERING AND CONSERVATION

This is a mechanically-minded age. Agriculture, in common with every industry, has been profoundly affected by the internal combustion engine, electricity, and a host of other advances in power and the tools of production.

Savings in time and labour are characteristic of modern machinery. Unfortunately, however, economy in cost has not kept pace with the technical improvement of implements. Tillage operations remain the most costly of all the various factors in crop production. Ontario farmers have been purchasing machinery at the rate of about \$40,000,000 a year, but as yet no farm machine has been perfected that will serve as a substitute for good soil and crop management. Where such management is lacking, the best of machines cannot be economical.

It is conceded that under present conditions no farmer can produce economically without some degree of mechanization. How far he should go is a matter of judgment in each particular case. Unfortunately the average farm has no cost-accounting department to calculate the exact point at which a new machine becomes a profitable investment. When a farm shed holds machinery costing more than the price of the land itself, as sometimes happens, it is time to take stock, and to ask some fundamental questions about the economics of agriculture. Perhaps enthusiasm for mechanization has overshadowed the importance of the basic enduring resource, which is the land. In the long run, sound conservation practices may well yield a better return than the most alluring machine.

Too often the case for soil conservation practices is associated with specialized and costly machinery. This Committee prefers to emphasize that the techniques of conservation (many of which are new) can usually be applied with conventional farm implements - even with horse-drawn

implements - if need be. It is not necessary to have a wide range of expensive gadgetry to be a conservation farmer. On the contrary, some of the best methods are very simple and some of the best farmers undoubtedly use few implements, but use them very well.

In tillage the objective should be the optimum degree of tilth consistent with maximum replenishment of organic matter and maintenance of the highly desirable crumb or granular soil structure.

There is a definite trend in Ontario toward the use of larger, heavier, and speedier power machinery, without sufficient regard for the effect such equipment may have on the compaction of the heavier soils, possibly leading to serious deterioration of the soil structure.

It is also noted that certain costly machines are being advertised for their ability to make a fine pulverized soil. On some lands such pulverizing would certainly hasten the depletion of organic matter and the breakdown of desirable soil structure.

To sum up: there is a heavy capital investment in machinery on Ontario farms; there is insufficient information regarding the economics of mechanized farming; there is also not enough information as to the effect of modern tillage operations on soil structure and erosion resistance. The time has come for an accelerated program of tillage research projects, which must be carried out on many different types of soil. Such studies should attempt to evaluate the effects of various implements and methods on various soils, and also assess their proper place in the economics of Ontario agriculture.

Broadly speaking there are three phases in which implements are used - fitting the soil, seeding and harvesting.

This Committee urges that tillage research should be directed in particular towards establishing what are the really essential and effective implements for fitting, seeding

and harvesting. There is a great need to ascertain whether good farming can be practised with fewer implements and simpler operations. For example, inquiry should be made into the possibility of developing more multi-purpose implements with inter-changeable parts. The Committee does not believe that numerous, elaborate and expensive implements are necessary on the average farm. Research should give priority to the evaluation of essential implements, with due regard for both cost and conservation.

WEED CONTROL

This Committee does not undertake to discuss the problem of weed control as a whole, except to comment that where the best farming practices are in effect, weeds are noticeably on the wane, and conversely that where poor management permits, weeds are flourishing or even gaining ground, particularly on worn-out and neglected pastures.

One particular aspect of weed control calls for mention in this report. The Committee had the opportunity to inspect the facilities for handling and cleaning grain at lakehead elevators. On the basis of the Committee's own observations and representations submitted, it appears that higher standards should be enforced with respect to the distribution and sale of screenings in Ontario.

Whole feed grains, with the exception of screenings, are marketed under grades outlined in a federal statute, the Canada Grain Act. Grade standards for ground grain, including all grades of screenings, are maintained under another federal statute, the Dominion Feeding Stuffs Act.

Under present standards the Committee finds that relatively large numbers of weed seeds are distributed in the lower grades, particularly screenings. There is evidence that, notwithstanding the grinding of screenings for feeding purposes, an estimated 10 per cent of the weed seed content remains viable after this process.

It is recognized that the Ontario livestock feeder is dependent to a large extent on feed grains from Western Canada. However valuable some of the better grades may be, the fact is that the lower grades of screenings are of low value, particularly those designated under the Feeding Stuffs Act, Table 6, as "Uncleaned Screenings" and "Refuse Screenings". Their nutritious value and palatability are both low. At the same time it seems certain that they carry weed seeds all over Southern Ontario.

This Committee therefore recommends that:

THE DOMINION GOVERNMENT SHOULD BE REQUESTED TO AMEND THE CANADA GRAIN ACT, THE FEEDING STUFFS ACT OR THE REGULATIONS THEREUNDER SO AS TO PROHIBIT THE SALE OR OFFERING FOR SALE IN ONTARIO OF THOSE CLASSES NOW DESIGNATED AS "UNCLEANED SCREENINGS" AND "REFUSE SCREENINGS", AND TO PROHIBIT THE MIXING OF SUCH CLASSES WITH ANY OTHER FEEDS, and

THE APPROPRIATE FEDERAL AND PROVINCIAL DEPARTMENTS SHOULD ACCELERATE A PROGRAM OF RESEARCH DESIGNED TO DESTROY THE VIABILITY OF WEED SEEDS GOING INTO FEEDS OR FEED MIXTURES.

HOME BEAUTIFICATION

Man does not live by bread alone. This was recognized in many of the briefs presented to this Committee. They not only stressed the protection of recreational values; they drew attention to what has been called "rural home beautification and farmstead planning". This is a phase of conservation which must not be overlooked. In one submission it was put this way:

"The arranging of fields to save labor and conserve soil, the laying out of farm buildings so that chores may be done with a minimum effort, the planning of farm kitchens to save steps and of farm homes for greater comfort, the landscaping of home surroundings, planting trees and shelterbelts, all bring lasting satisfaction and enhance farming as a way of life".

Nothing is more depressing than a "rural slum" - the tumble-down shack, ruined barn, dilapidated fences and triumphant weeds which signify the run-down worn-out farm, or land never suitable for agriculture. Not much better are the drab, severely solid structures, built without thought for either appearance or convenience.

On the other hand, there is no sight in Canada finer than the neat well-tended farmstead, protected by trees and grass, blending naturally into the splendid setting of a productive farm. There is a definite connection between the good-looking farm home and the well-managed farm.

It has also been pointed out that the aesthetic desire for conservation practices on a farm sometimes has an even greater appeal than the material benefits to be derived from such practices. Some people, for example, want shelterbelts and windbreak plantings to add to the beauty of the farm rather than because such plantings provide a wildlife habitat or protect against wind erosion. This very human desire to improve appearances is one to be encouraged, for it can have many beneficial results.

Most of Ontario, settled or unsettled, has great natural beauty. Conservation practices basically call for

co-operation with Nature, and therefore lead to the restoration of attractions which have too often been destroyed by man's recklessness or neglect. With Nature always ready and willing to help, it is not difficult to improve the appearance of the average Ontario farmstead. This process would not only add dignity and charm to the rural home; it would encourage more people to remain in farming and enjoy the attractions of rural life. A fair and well-loved countryside can also do much for the morale and well-being of the entire population, particularly in a day when so many people travel by car and so many wisely choose to spend their weekends, holidays and vacations in the country.

A noticeable feature in some townships is the well-kept beautifully-landscaped cemetery. It reflects credit on the local community. Regrettably, however, there are many old cemeteries throughout the Province which have been allowed to fall into an unkept, dishevelled condition. It is to be hoped that community effort will find a solution for this problem.

Among other land-marks along the roads and highways are schools, churches, aged buildings and historic sites - some more attractive than others. These too should be maintained in such a manner that they can be shown with pride to any visitor. These are things which play an important part in the spirit of a free people - just as our lakes, rivers and forests do.

This Committee therefore believes that every encouragement should be given, whether through tree-planting projects or otherwise, to the trend towards farmstead planning and home beautification. In this work the Departments of Agriculture, Lands and Forests, Highways and Education can provide much aid and guidance, and there are many voluntary organizations eager to co-operate.

CONCLUSION

CHAPTER 47

LOOKING TO THE FUTURE

What is the central purpose of a policy or program for conservation in Ontario? What is the underlying principle of the recommendations set out in the foregoing chapters of this report?

The principle must be that it is only wise for us to live in balance with Nature, maintaining those renewable resources, notably soil, water and wood, which are the heritage of this and other generations. To accept that principle presupposes that we are a sane and responsible people, that we do not wish to deprive our descendants of their birthright, and that we agree with the view of the Nigerian Chieftain who said:

"I conceive that the land belongs to a vast family of which many are dead, few are living and countless numbers are still unborn".

The purpose must be to adjust our thinking and our practices to conform with the principles of sound land use and to allow Nature the fullest opportunity to replenish our renewable resources, with such assistance from us as may be necessary by reason of our own interference with natural processes.

The earliest settlers on this continent were forced to wrest a living from what was called "the wilderness". The struggle for survival seemed like a battle with Nature or a battle against Nature. Our forefathers had to cut down the forest before crops could be grown; after a day's hard labour with an axe, the tree looked like an enemy. For generations there was so much hardship in rural life that countless young people from the country sought haven in crowded cities. The idea of hostility between man and his natural environment has had a powerful influence in our national life. We thought in terms of fighting and defeating the intractable and unruly forces of Nature: removing the forest, subduing the rivers,

occupying the swamps, slaughtering the game and outwitting the weather.

It was an unequal struggle in which Nature met defeat long ago, but old ideas die hard and old habits of thinking persist. We have now to learn that co-operation with Nature will yield far greater rewards than ruthless exploitation.

Our first need, therefore, is a change of attitude toward our natural environment in Ontario. In making the change, education and extension have a large part to play, and neither of these can succeed without steady progress in research and scientific knowledge.

A new mental attitude on the part of the individual is not in itself sufficient. Ontario is no longer a scattering of pioneer lumbering and agricultural communities. It is a great economic complex with highly diversified and highly organized activities into which the individual is required to fit himself. It is part of a complicated world in which laws and regulations, markets and mortgages, are often more powerful than personal preferences.

A second great need, therefore, is that the law should adjust itself to achieve greater harmony with natural processes. A good many examples have been cited in this report.

The third great need is that the activities of government at all levels should promote and assist the conservation practices which are to be undertaken by individuals, while government itself must accept responsibility for enterprises like the reforestation of large areas which are beyond the capacity of any individual. In either case, there is necessity for an over-all policy and for its execution in an integrated and co-ordinated way.

Finally, in this highly organized society, great importance must be accorded to the voluntary association - to those who act together in their own township, village or city,

in their own watershed or their own producers' group. In Ontario the role of these voluntary organizations is already significant, and they can undoubtedly make or break any conservation program.

In formulating the recommendations of this report, the attempt has been made to give due recognition to the respective parts of the individual, of his voluntary association, and of government and its agencies, at all levels, each and all of whom have an essential contribution to make.

Looking to the future, it is not pretended that we shall succeed in a day or a night. The measure of our success will be the condition of Ontario and its natural resources 50 or 100 years hence.

What is to be the determining factor in our success? In all probability it will depend on the degree of importance which we are now willing to give to the problems relating to conservation which have been discussed in this report. In our official and private capacities we all pass judgment on such problems. By our deeds or by default we disclose the value we are prepared to place on conservation.

Conservation usually comes to the front in public interest as the result of some great and spectacular disaster. It requires more intelligence and foresight to become interested in conservation before disaster makes it a burning issue.

It is true that the wastage and depletion of resources are not as obvious and not so spectacular in Ontario as in some countries. In our frigid zone, erosion, for example has not gone as far as in China, which has been farmed for 40 centuries, or in the Southern States, or in South Africa where Prime Minister J. C. Smuts said:

"Erosion is the biggest question before the country today - bigger than any politics".

Nevertheless, wastage and depletion have occurred on a large and significant scale in Ontario. The very fact that they proceed in a more subtle and less spectacular way than in

other areas tends to make them the more dangerous - there is the danger that we might be lulled into complacency. He who loses six inches of topsoil in 35 years has lost it - and he is no better off than he who lost it in three years. One may proceed more slowly than the other - but the result in the end is the same.

The hope of this Committee is that Ontario will accept a conservation program worthy of the name while yet there is time, and that we may show our intelligence and vision by taking action before, rather than after, the event, so that desperate emergency measures of reclamation and rehabilitation will never become necessary in this Province.

BRIEFS PRESENTED

1. Organizations and Individuals

(a) County and District Organizations

Algoma Agricultural Committee

Atwood Agricultural Society

Ausable River Conservation Authority

Black River, Municipality of

Brant County Council Committee on Conservation

Bruce County Agricultural Organizations

Bruce County Council Reforestation Committee

Bruce Peninsula Resort Association

Caledonia, Dunnville and Hagersville Hunters and Anglers Clubs

Calvert, Municipality of

Carleton County Council Agricultural Committee

Clinton Fish and Game Club

Cochrane District Committee on Conservation

Combined Committee on Conservation from the Counties of Leeds, Grenville, Dundas, Stormont, Glengarry, Prescott and Russell

Combined Committee on Conservation from the Counties of Halton, York and Peel

Combined Committee on Conservation from the Counties of Northumberland, Prince Edward, Hastings, Lennox and Addington and Frontenac

Combined Committee on Conservation from the Counties of Peterborough, Durham, Victoria and Ontario

Don River Conservation Authority

Dufferin and Simcoe Counties Forestry Committee

Dufferin and Simcoe Counties Conservation Committee

Dryden Junior Chamber of Commerce

Elgin County Conservation Committee

Essex County Conservation Committee

Fort William Civic Industrial Board

Ganaraska River Conservation Authority

Grand River Conservation Authority

Grey County Agricultural Organizations
Haldimand County Agricultural Organizations
Hearst Crop Improvement Association
Humber River Conservation Authority
Huron County Council Forestry Committee
Huron County Agricultural Organizations
Kawartha Conservation Association
Kenora Camp Owners Association
Kenora District Farm Organizations
Kent County Conservation Committee
Lambton County Agricultural Organizations
Lambton County Council Reforestation Committee
Lanark County Conservation Committee
Lumber and Sawmill Workers Local Union 2638,
Fort William
Manitoulin District Committee on Conservation
Matheson Fish and Game Protective Association
Matheson Agricultural Society
Middlesex County Committee on Conservation
Moira River Conservation Authority
Montjoy, Improvement District of
Muskoka Agricultural Organizations
Napanee River Conservation Authority
Nipissing District Agricultural Organizations
Norfolk County Committee on Conservation
Norfolk Fish and Game Protective Association
Northern Ontario Outfitters Association
Northern Ontario Registered Seed Growers Association
Owen Sound Public Utilities Commission
Oxford County Agricultural Organizations
Oxford County Council Reforestation Committee
Oxford County Fish and Wildlife Protective
Association
Parry Sound Agricultural Organizations
Perth County Agricultural Organizations

Playfair, Municipality of
Porcupine Chamber of Commerce
Rainy River District Agricultural Organizations
Renfrew County Crop Improvement Association
Renfrew Hydro Commission
Simcoe County Federation of Agriculture
South Nation River Conservation Authority
South Simcoe Agricultural Committee
Sudbury Agricultural Organizations
Sudbury District Algonquin Zone of the Ontario
Federation of Anglers and Hunters
Sydenham Sportmen's Association
Temiskaming Agricultural Organizations
Thunder Bay Citizens Committee
Thunder Bay District Committee on Conservation
Timmins Kiwanis Club
Upper Thames River Conservation Authority
Val Gagne Agricultural Society
Val Gagne Credit Union
Waterloo County Committee on Conservation
Welland County Committee on Conservation
Wellington County Agricultural Organizations
Wellington County Council Committee of Reforestation
Wentworth County Agricultural Societies
Wingham Chamber of Commerce

(b) Provincial Organizations and Universities

Agricultural Institute of Canada (Ontario Branch)
Canadian Forestry Association of Ontario
Ontario Agricultural College Alumni Association
Ontario Conservation and Reforestation Association
Ontario Crop Improvement Association
Ontario Federated Women's Institutes
Ontario Federation of Agriculture
Ontario Horticultural Association

Ontario Junior Farmers Association

Ontario Junior Institutes

Ontario Plowmen's Association

Ontario Shore and Beach Preservation Association

Royal Botanical Gardens (Hamilton)

McMaster University

Queen's University

University of Western Ontario

(c) Individuals

A. E. Bunnell	-	Toronto
J. E. Carter	-	Guelph
Paul Fisher	-	Burlington
J. D. Gilmour	-	Montreal
W. G. McGeorge	-	Chatham
N. B. McRostie	-	Ottawa
W. R. Pearce	-	Port Arthur
W. H. Porter	-	London
A. F. Coventry	-	University of Toronto
G. B. Langford	-	University of Toronto
D. F. Putnam	-	University of Toronto
G. R. Lord	-	University of Toronto

2. Meetings and Hearings of the Committee

<u>Date</u>	<u>Place</u>
July 18 - 19	Ontario Agricultural College, Guelph
20	Listowel
21	Walkerton and Owen Sound
22	Barrie and Midhurst
26 - 27	Central Experimental Farm, Ottawa
28	Renfrew
29	Pembroke and Chalk River
Aug. 2	Chatham
3	London
4	Delhi

<u>Date</u>	<u>Place</u>
Aug. 5	Woodstock
8	Wlarton
9	Bruce Peninsula
22	New Liskeard
23	Matheson
24	Cochrane and Kapuskasing
25	Port Arthur
26	Fort William
27	Fort Frances and Emo
28	Nestor Falls
29	Dryden
30	Sault Ste. Marie
31	Sudbury
Sept. 1	North Bay
7	Lindsay
8	Brooklin
9	Brampton
13	Kemptville
14	Morrisburg
15	Belleville
28	Gore Bay and Little Current
Oct. 11	St. Catharines and Vineland
12	London
13	Ridgetown
14	Harrow
18 - 20	Muskingum Conservancy District, Ohio, U. S. A.
24 - 28	Toronto
Nov. 1	North Bay
2 - 3	La Sarre, P. Q.
7 - 10	Toronto
11	Oakville, Trafalgar and Grimsby

<u>Date</u>	<u>Place</u>
Nov. 14 - 18	Toronto
21 - 22	Toronto
23	Kingston
24 - 25	Toronto
28 - Dec. 2	Toronto
Dec. 5 - 9	Toronto
12 - 16	Toronto
20 - 24	Ontario Agricultural College, Guelph
Jan. 9 - 14	Ontario Agricultural College, Guelph
19 - 21	Toronto

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